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Ontario. Legislative Assembly

SESSIONAL PAPERS

VOL. XXV.—PART IX.

THIRD SESSION OF SEVENTH LEGISLATURE

OF THE

PROVINCE OF ONTARIO.

31681
13/12/93

SESSION 1893.

TORONTO:
PRINTED FOR LUD. K. CAMERON, QUEEN'S PRINTER,
BY WARWICK & SONS, 68 AND 70 FRONT STREET WEST.
1893.

LIST OF SESSIONAL PAPERS.

ARRANGED ALPHABETICALLY.

TITLE.	No.	REMARKS.
Accounts (*Dominion and the Provinces*)	65	*Printed.*
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Agricultural Societies, Analysis	60	*Not printed.*
Anatomy, Inspector, Bodies received by	71	*Printed.*
Asylums, Report	8	"
Baxter, Judge, commutation	33	*Not printed.*
Bee-Keepers' Association, Report	83	*Printed.*
Births, Marriages and Deaths, Report	5	"
Blind Institute, Report	6	"
Bonds and Securities	53	*Not printed.*
Canadian Institute, Report	23	*Printed.*
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Cholera regulations	66	"
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Crown Lands Report	17	"
Dairymen's and Creameries', Report	16	*Printed.*
Deaf and Dumb Institute, Report	7	"
Dehorning Cattle, Report	2	"
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Duffern License Commissioners, correspondence	91	*Not printed.*
Education, Report	3	*Printed.*
" publication of Text-Books, O. in C	42	*Not printed.*
" publication of French Grammar	43	"
" lecturers at School of Pedagogy	44	"
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" Niagara Falls High School	46	"
" Toronto Junction High School	47	"
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Entomological Society, Report	12	*Printed.*
Estimates	15	"

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Farmers' Institute, Central, Report	84	"
Fire Ranging, expenditure	41	"
Fish and Game, Report	76	"
Forest Reservation and National Park, Report	31	"
Forestry, Forest Schools Management, Report	30	"
Fruit Growers', Report	13	"
Game and Fish, Report	76	*Printed.*
Gaols, Prisons and Reformatories, Report	9	"
Government Roads	78	"
Health, Report	28	*Printed.*
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" regulations *re* ice supply	67	"
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Houses of Refuge, Report	10	"
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Immigration, Report	18	"
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Jones *vs.* Sharpe, correspondence	63	"
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Kirkpatrick, Lieutenant-Governor	57	*Printed.*
Lands sold, amounts due on	68	*Printed.*
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Librarian, Report	37	*Not printed.*
Lieutenant-Governor, appointment	57	*Printed.*
Liquor Licenses, Report	19	"
" number issued	49	"
" convictions in N. Ontario	88	*Not printed.*
Magdalen Asylums, Report	10	*Printed.*
Manley, conduct of	51	*Not printed.*
Medical Council, sums paid to members	86	*Printed.*
Middlesex Registry Office, vacancies in	58	*Not printed.*
Mines, Report of Bureau	85	*Printed.*
Mosgrove, Judge, commutation	34	*Not printed.*
Municipal indebtedness	89	*Printed.*
Municipal Taxation, Report	73	"
Municipal Treasurers, defalcations	79	"
Orphan Asylums, Report	10	*Printed.*
Ottawa Separate Schools, correspondence	50	"
Paget and Regan, correspondence	63	*Not printed.*
Pedagogy, lecturers	44	"
Pedgaogy, appointments and dismissals	54	*Printed.*

Title.	No.	Remarks.
Plebiscite Petitions	93	*Printed*
Poultry and Pet Stock, Report	82	"
Prisons, Report	9	"
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Public Accounts	14	*Printed.*
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Queen Victoria Niagara Falls Park, Report	69	*Printed.*
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Secretary and Registrar, Report	90	*Printed.*
Statutes, Revised, disposal of	35	*Not printed.*
Statutes, Sessional, disposal of	36	"
Tavern and Shop Licenses, Report	19	*Printed.*
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Timber sales from 1871	92	"
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Titles, Report of Master	61	"
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Toronto Normal School, appointments, etc.	54	*Printed.*
Toronto University, Report	70	"
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" Finance Report	21	"
Upper Canada College, Report	29	*Printed.*
York Branch River Bridge	80	*Not printed.*
York House of Industry, Report	40	"

LIST OF SESSIONAL PAPERS.

Arranged in Numerical Order with their Titles at full length : the dates when Ordered and when presented to the Legislature : the name of the Member who moved the same, and whether Ordered to be Printed or not.

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No. 1.. Report of the Standing Committee on the Faculty of Medicine, University of Toronto, on the subject of Re-organization. Presented to the Legislature, 10th April, 1893. (*Printed.*)

No. 2.. Report of the Commissioners appointed to enquire into the practice of Dehorning Cattle. Presented to the Legislature, 10th April, 1893. (*Printed.*)

No. 3.. Report of the Minister of Education for the year 1892, with Statistics of 1891, in which is included the Reports upon the Scientific Institutions and School of Practical Science. Presented to the Legislature, 5th April, 1893. (*Printed.*)

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No. 4.. Report of the Inspector of Insurance and Registrar of Friendly Societies for the year 1892. Presented to the Legislature, 5th April, 1893. (*Printed.*)

No. 5.. Report relating to the Registration of Births, Marriages and Deaths for the year 1892. Presented to the Legislature, 19th May, 1893. (*Printed.*)

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No. 6.. Report upon the Ontario Institution for the education and instruction of the Blind, Brantford, for the year ending 30th September, 1892. Presented to the Legislature, 5th April, 1893. (*Printed.*)

No. 7.. Report upon the Ontario Institution for the education of the Deaf and Dumb, Belleville, for the year ending 30th September, 1892. Presented to the Legislature, 5th April, 1893. (*Printed.*)

No. 8.. Report upon the Lunatic and Idiot Asylums of the Province for the year ending 30th September, 1892. Presented to the Legislature, 10th April, 1893. (*Printed.*)

No. 9.. Report upon the Common Gaols, Prisons and Reformatories, for the year ending 30th September, 1892. Presented to the Legislature, 5th April, 1893. (*Printed.*)

No. 10.. Report upon the Houses of Refuge and Orphan and Magdalen Asylums for the year ending 30th September, 1892. Presented to the Legislature, 10th April, 1893. (*Printed.*)

No. 11.. Report of the Agriculture and Arts Association for the year 1892. Presented to the Legislature, 10th April, 1893. (*Printed.*)

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No. 12.. Report of the Entomological Society for the year 1892. Presented to the Legislature, 10th April, 1893. (*Printed.*)

No. 13.. Report of the Fruit Growers' Association for the year 1892. Presented to the Legislature, 10th April, 1893. (*Printed.*)

No. 14.. Public Accounts of the Province for the year 1892. Presented to the Legislature, 5th April, 1893. (*Printed.*)

No. 15.. Estimates for the service of the Province until the Estimates of the year are finally passed. Presented to the Legislature, 5th April, 1893. (*Not printed.*) Estimates for the year 1893. Presented to the Legislature, 5th April, 1893. (*Printed.*) Estimates required for the service of the Province until the Estimates for the year are finally passed. Presented to the Legislature, 1st May, 1893. (*Not printed.*) Estimates (supplementary) for the year 1893. Presented to the Legislature, 25th May, 1893. (*Printed.*)

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No. 16.. Report of the Dairymen's and Creameries' Associations of the Province for the year 1892. Presented to the Legislature, 19th May, 1893. (*Printed.*)

No. 17.. Report of the Commissioner of Crown Lands for the year 1892. Presented to the Legislature, 18th April, 1893. (*Printed.*)

No. 18.. Report of the Department of Immigration for the year 1892. Presented to the Legislature, 5th May, 1893. (*Printed.*)

No. 19.. Report upon the working of the Tavern and Shop Licenses Act for the year 1892. Presented to the Legislature, 10th April, 1893. (*Printed.*)

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No. 20.. Report of the Bureau of Industries for the year 1892. Presented to the Legislature, 12th May, 1893. (*Printed.*)

No. 21.. Report of the Standing Committee on Finance, University of Toronto. Presented to the Legislature, 10th April, 1893. (*Printed.*)

No. 22.. Report of the Ontario Agricultural College and Experimental Farm for the year 1892. Presented to the Legislature, 10th April, 1893. (*Printed.*)

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No. 23 .. Report for the Canadian Institute for the year 1892. Presented to the Legislature, 19th May, 1893. (*Printed.*)

No. 24.. Report of the Commissioner of Public Works for the year 1892. Presented to the Legislature, 12th April, 1893. (*Printed.*)

No. 25.. Reports of the Inspectors of Factories of the Province for the year 1892. Presented to the Legislature, 19th May, 1893. (*Printed.*)

No. 26.. Report of the Inspector of Division Courts for the year 1892. Presented to the Legislature, 19th May, 1893. (*Printed.*)

No. 27.. Report of the Inspector of Legal Offices for the year 1892. Presented to the Legislature, 2nd May, 1893. (*Printed.*)

No. 28.. Report of the Provincial Board of Health for the year 1892. Presented to the Legislature, 19th May, 1893. (*Printed.*)

No. 29.. Report of Upper Canada College for the year ending 30th June, 1892. Presented to the Legislature, 6th April, 1893. (*Printed.*)

No. 30.. Papers and Reports upon Forestry, Forest Schools, Administration and Management. Presented to the Legislature, 20th April, 1893. (*Printed.*)

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No. 31.. Report of the Royal Commission on Forest Reservation and National Park Presented to the Legislature, 20th April, 1893. (*Printed.*)

No. 32.. Report of the Drainage Commission for the Province, 1892-3. Presented to the Legislature, 4th May, 1893. (*Printed.*)

No. 33.. Copy of an Order in Council commuting the fees payable to His Honour Judge Baxter, under the Surrogate Courts Act. Presented to the Legislature, 5th April, 1893. (*Not printed.*)

No. 34.. Copy of an Order in Council respecting the payment of Surrogate Court fees to His Honour, Judge Mosgrove. Presented to the Legislature, 5th April, 1893. (*Not printed.*)

No. 35.. Statement as to the disposal of the Revised Statutes for the year 1892. Presented to the Legislature, 5th April, 1893. (*Not printed.*)

No. 36.. Statement as to the disposal of the Sessional Statutes for the year 1892. Presented to the Legislature, 5th April, 1893. (*Not printed.*)

No. 37.. Report of the Librarian on the state of the Library. Presented to the Legislature, 6th April, 1893. (*Not printed.*)

No. 38.. Report upon the Hospitals of the Province for the year ending 30th September, 1892. Presented to the Legislature, 14th April, 1893. (*Printed.*)

No. 39.. Report of the House of Industry and Refuge, County of Elgin. Presented to the Legislature, 10th April, 1893. (*Not printed.*)

No. 40.. Report on the House of Industry, County of York. Presented to the Legislature, 10th April, 1893. (*Not printed.*)

No. 41.. Return to an Order of the House, of the sixth day of April, 1892, shewing the expenditure in each year, since the system of fire ranging has been established for that service, the amount of refunds in each year, and the amount remaining unpaid on account of the licensee's share of the expenditure. Presented to the Legislature, 10th April, 1893. Mr. *Meredith.* (*Printed.*)

No. 42.. Copy of an Order-in-Council approving of certain agreements in regard to publication of Text Books. Presented to the Legislature, 11th April, 1893. (*Not printed.*)

No. 43.. Copy of an Order-in-Council respecting a certain indenture of agreement in regard to the publication of the High School French Grammar. Presented to the Legislature, 11th April, 1893. (*Not printed.*)

No. 44.. Copy of an Order-in-Council respecting the appointment of Lecturers at the School of Pedagogy for the Session of 1892-93. Presented to the Legislature, 11th April, 1893. (*Not printed.*)

No. 45.. Copy of an Order inCouncil raising the High School at Goderich to the status of a Collegiate Institute. Presented to the Legislature, 11th April, 1893. (*Not printed.*)

No. 46.. Copy of an Order-in-Council relating to the establishment of a High School at Niagara Falls. Presented to the Legislature, 11th, April, 1893. (*Not printed.*)

No. 47.. Copy of an Order-in-Council respecting the establishment of a High School at Toronto Junction. Presented to the Legislature, 11th April, 1893. (*Not printed.*)

No. 48.. Copy of an Order-in-Council respecting the performance, during his absence through illness, of certain of the duties of the Inspector of Model Schools. Presented to the Legislature, 11th April, 1893. (*Not printed.*)

No. 49.. Return to an Order of the House of the seventeenth day of March, 1892, for a Return shewing the number of liquor licenses issued in each year from 1876 to 1891, both inclusive. The gross fund raised from licenses in each of the same years. The sums paid out of the said fund in each of the same years to the Province and the Municipalities respectively, and the sums the Municipalities have imposed by by-law over and above the Statutory Duties in each of the same years. Presented to the Legislature, 12th April, 1893. Mr. *Clancy.* (*Printed.*)

No. 50.. Return to an Order of the House of the twenty-third day of March, 1892, for a Return of copies of all correspondence between Mr. Inspector White and the Board of Separate School Trustees of the City of Ottawa, together with copies of all reports made by the Inspector to the said Board, with reference to the Separate Schools of the City, during the year 1891. Presented to the Legislature, 12th April, 1893. Mr. *Whitney.* (*Printed.*)

No. 51.. Return to an Order of the House of the twenty-fifth day of March, 1892, for a Return of copies of all correspondence between the Minister of Education, Sir Daniel Wilson, and one Manley, late caretaker or janitor of the School of Practical Science, or any other person or persons, relating to the conduct of said Manley while janitor, and his dismissal from said position. Presented to the Legislature, 12th April, 1893. Mr. *Whitney.* (*Not printed.*)

No. 52.. Return to an Order of the House of the eleventh day of April, 1892, for a Return shewing the number of County pupils attending High Schools or Collegiate Institutes in Towns separated from Counties for Municipal purposes, for each of the past three years ending 30th June; the amounts paid by said Counties to the said High Schools and Collegiate Institutes

for the same period; the amounts paid by said Counties to the said High Schools and Collegiate Institutes under the High Schools Act of 1891. Presented to the Legislature, 12th April, 1893. Mr. *Preston.* (*Printed*)

No. 53.. Statement of Bonds and Securities registered by Officers of the Province during the year 1892 Presented to the Legislature, 14th April, 1893. (*Not printed.*)

No. 54.. Return to an Order of the House of the twenty-fifth day of March, 1892, for a Return giving the names of all persons who have been appointed to, who have resigned and been dismissed from positions in the Toronto Normal School, the Toronto Model School and the School of Pedagogy, within the last five years, together with copies, in each case, of all correspondence relating to the same between the Minister of Education or any member of the Government, or any officer of the Department of Education and the parties in question, or any other person or persons. Also, copies of all petitions, memorials and communications addressed to the Minister of Education, or any member of the Government, on the part of any, or all of the students of the Toronto Normal School, the Toronto Model School and the School of Pedagogy, within the last five years, and of any replies thereto on the Department of Education or the Government. Presented to the Legislature, 14th April, 1893. Mr. *Whitney.* (*Printed.*)

No. 55 . Return to an Order of the House of the fourth day of April, 1892, for a Return shewing the names of all authors and publishers of Public and High School text-books, with the respective books published by them and the prices thereof. Also, for the copies of all correspondence by or with the Minister of Education, or any officer of his department, respecting the price or publication of Public or High School text-books, subsequent to that already brought down. Presented to the Legislature, 14th April, 1893. Mr. *Kerns.* (*Printed.*)

No. 56.. Report of the Toronto General Trusts Company for the year 1892. Presented to the Legislature, 17th April, 1893. (*Not printed.*)

No. 57.. Copy of Commission appointing the Honourable George Airey Kirkpatrick, P.C., to be Lieutenant-Governor of the Province of Ontario, and of the instructions thereto attached. Presented to the Legislature, 20th April, 1893. (*Printed.*)

No. 58.. Return to an Order of the House of the tenth day of April, 1893, for a Return shewing how often, in the past ten years, the office of Registrar of Deeds for the North and East Ridings of the County of Middlesex has become vacant; the dates when the vacancies occurred and when they were filled, and, if the office is now vacant, how long the vacancy has continued. Presented to the Legislature, 20th April, 1893. Mr. *Meredith.* (*Not printed.*)

No. 59.. Papers and Documents relating to the Kingston, Napanee and Western Railway Company, the Ottawa, Arnprior and Parry Sound Railway Company, the Irondale, Bancroft and Ottawa Railway Company, and the Central Counties Railway Company. Presented to the Legislature, 25th May, 1893. (*Printed.*)

No. 60.. Analysis of Reports of Electoral District and Township Agricultural and Horticultural Societies in Ontario for the year 1892. Presented to the Legislature, 21st April, 1893. (*Not printed.*)

No. 61.. Report of the Master of Titles for the year 1892. Presented to the Legislature, 21st April. 1893. (*Printed*)

No. 62.. Return to an Address to His Honour the Lieutenant-Governor of the 12th day of April, 1893, praying that he will cause to be laid before this House a Return of the timber berths offered for sale at the sale of 13th October, 1892, and of the births then sold, including those sold by private contract after the auction sale, with the area of each berth, the price *per* square mile paid, the names of the several purchasers, the sums received on account of purchase money, the date of the payment thereof and the sums (if any) remaining unpaid on the 1st January, 1893, and shewing whether any, and if so which of the said berths had been previously sold, and when and to whom and for what price, and also for a return of a copy of the advertisement and conditions of sale, and of the Order-in-Council authorizing the sale. Presented to the Legislature, 24th April, 1893. Mr. *Whitney.* (*Printed.*)

No. 63.. Return to an Order of the House of the 4th day of April, 1892, for a Return of copies of all correspondence between the Commissioner of Crown Lands, or any officer of the Department of Crown Lands and George Paget and John Regan, or either of them, on the subject of, or with reference to an action in the High Court of Justice, Queen's Bench Division, between F. J. Jones plaintiff, and James Sharpe, Peter McDermott, George Paget and John Regan defendants, which said action was tried, or partially tried, before the Honourable Mr. Justice Rose at Hamilton, on the 2nd day of October, 1890, and settled by the parties thereto. Giving also, copies of all correspondence between the said Commissioner, or any such officer, and any other person or persons on the subject of or with reference to, the said action. Presented to the Legislature, 24th April, 1893. Mr. *Whitney.* (*Not printed.*)

No. 64.. Return to an Address to His Honour the Lieutenant-Governor of the first day of April, 1892, praying that he will cause to be laid before this House a copy of the Order-in-Council for the appointment of a Commissioner to examine into the claims of the Township of Proton in respect of the Land Improvement Fund, of the Commission used in pursuance thereof, and for a statement in detail of all expenses incurred in respect of the enquiry and report. Presented to the Legislature, 25th April, 1893. Mr. *Meredtth.* (*Not printed.*)

No. 65... Copy of an Order-in-Council adopting the first agreement of submission to the Arbitrators appointed for the settlement of the accounts between the Government of the Dominion of Canada and the Governments of the Provinces of Ontario and Quebec, and as between the said Provinces of Ontario and Quebec. Presented to the Legislature, 26th April, 1893. (*Printed.*)

No. 66.. Regulations of the Provincial Board of Health, with respect to Cholera, approved by Order-in-Council, dated 11th April, 1893. Presented to the Legislature, 26th April, 1893. (*Printed.*)

No. 67.. Copy of an Order-in-Council approving of the Regulations respecting the sources of supply and the place of storage of Ice intended for domestic use or cooling purposes, adopted by the Provincial Board of Health. Presented to the Legislature, 26th April, 1893. (*Printed.*)

No. 68.. Return in part, to an Order of the House of the eleventh day of April, 1892, for a Return shewing by Townships the amount remaining unpaid on the

31st December last on lands sold, of (1) Crown Lands, (2) Common School Lands, (3) Grammar School Lands, (4) Railway Lands, and the aggregate amount due in respect of each of the said classes of lands, distinguishing the amounts due for principal and interest respectively. Presented to the Legislature, 26th April, 1893. Mr. *Meredith.* (*Printed*)

No. 69.. Report of the Commissioners for the Queen Victoria Niagara Falls Park. Presented to the Legislature, 28th April, 1893. (*Printed.*)

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No. 70.. Report of the University of Toronto for the year 1891-92, including the Reports of the University and College Councils, together with the Bursar's statement for the year 1892. Presented to the Legislature, 17th May, 1893. (*Printed.*)

No. 71.. Return to an Order of the House of the eleventh day of April, 1892, for a Return shewing the number of bodies received by the Inspector of Anatomy, during each of the past five years from (1) Charitable Institutions (2) Criminal Institutions and (3) all other sources in the Province. Shewing also, the number of persons who have died from natural causes in each of the above named institutions during the same period, and the number of the criminal class who had spent ten years or more in prison before dying in prison, and the number of persons who during the same period have died at the hands of the executioner. Presented to the Legislature, 1st May, 1893. Mr. *Meacham.* (*Printed.*)

No. 72.. Return to an Order of the House of the ninth day of March, 1892, for a Return, shewing the estimated quantity of Pine Timber now standing upon the Crown domain of the Province and the estimated value thereof, setting the same forth as far as practicable by a description, by number or otherwise, of the berths upon which the same is standing, and where the territory has not been divided into timber berths, shewing the localities as far as practicable, and also shewing the data upon which such estimates are based, as far as practicable. Presented to the Legislature, 1st May, 1893. Mr. *Wood* (*Hastings*) (*Printed*)

No. 73.. Report of the Commission on Municipal Taxation. Presented to the Legislature, 5th May, 1893. (*Printed.*)

No. 74.. Return to an Address to His Honour the Lieutenant-Governor of the twelfth day of April, 1893, praying that he will cause to be laid before this House a Return of the names of the several purchasers of the timber berths disposed of at the sale of October, 1890, and of the sales, if any, which were not carried out, and of the amounts, if any, remaining unpaid on account of the purchase money, if any, of such of lots and of a copy of the Order in Council authorizing the sale and of the advertisement and conditions of sale Presented to the Legislature, 4th May, 1893. Mr. *Campbell* (*Algoma.*) (*Printed.*)

No. 75.. Return from the Records of the several Elections to the Legislative Assembly, in the Electoral District of the City of Toronto, of the County of Peel, and the City of Toronto, since the General Election of 1890, shewing:— (1) The number of votes polled for each candidate in each Electoral District in which there was a contest. (2) The majority whereby each successful candidate was returned. (3). The total number of votes polled in each District. (4) The number of votes remaining unpolled. (5) The

number of names on the Voters' List in each District. (6) The population of each District as shewn by the last census. Presented to the Legislature, 22nd May, 1893. (*Printed.*)

No. 76.. Report of the Ontario Game and Fish Commission. Presented to the Legislature, 11th May, 1893. (*Printed.*)

No. 77.. Return to an Order of the House of the third day of May, 1893, for a Return of copies of all correspondence between the License Inspector of North Brant, or other parties, and the License Department, of any member of the Government, in connection with the application of William T. Jenkinson for a tavern license in polling sub division No. 10, Brantford Township. Presented to the Legislature, 8th May, 1893. (Mr. *McCleary.*) (*Not printed.*)

No. 78.. Return to an Order of the House of the nineteenth day of April, 1893, for a Return shewing, separately for each County, the expenditure on colonization, Government, or County Roads and Bridges, by the Crown Lands Department, in the Counties of Victoria, Peterborough, Hastings, Addington and Frontenac during the year 1892, with the location and amount expended on each road and bridge, and giving the name of the overseer in charge, and the amount received by such overseer, for his own services out of each expenditure. Presented to the Legislature, 8th May, 1893. Mr. *Wood* (*Hastings.*) (*Printed.*)

No. 79.. Return to an Order of the House of the twenty-third day of March, 1892, for a Return shewing amounts of defalcations made by the Treasurers of any of the Municipalities in the Province of Ontario during the years 1871 to 1891, both inclusive. Shewing also, the amounts any of said municipalities have lost during the same time for want of sufficient sureties being given by said Treasurers, and also shewing the number of Commissions of Enquiry into the finances of municipal corporations issued during said years under Section 383 of the Municipal Act. Presented to the Legislature, 9th May, 1893. Mr. *Balfour.* (*Printed.*)

No. 80.. Return to an order of the House of the nineteenth day of April, 1893, for a Return of copies of all correspondence in connection with an application for a new Bridge over York Branch River, between lots 20 and 21, in the Township of Carlow, in the County of Hastings, during the year 1892, and all papers or memoranda connected therewith. Presented to the Legislature, 10th May, 1893. Mr. *Wood* (*Hastings.*) (*Not printed.*)

No. 81.. Returns of all Fees and Emoluments received by the Registrars of Ontario for the year 1892, under the provisions of R.S.O. 1887. cap. 114, sec. 100, with which are contrasted receipts of the same nature in the years 1890 and 1891. Presented to the Legislature, 12th May, 1893. (*Printed.*)

No. 82.. Reports of the Poultry and Pet Stock Associations for the year 1892. Presented to the Legislature, 12th May, 1893. (*Printed.*)

No. 83.. Report of the Bee-Keepers Association for the year 1892. Presented to the Legislature, 12th May, 1891. (*Printed.*)

No. 84.. Report of the Central Farmers' Institute for the year 1892. Presented to the Legislature, 12th May, 1893. (*Printed.*)

No. 85.. Report of the Bureau of Industries for the year 1892. Presented to the Legislature, 12th May, 1893. (*Printed.*)

No. 86.. Return to an Order of the House of the fifth day of May, 1893, for a Return from the Treasurer of the Medical Council, giving a detailed statement of the sums paid to each member of the Medical Council during the past five years, for travelling expenses and hotel accommodation while attending Council and Committee meetings, and also of the details of the amount not down in the financial returns for 1890, 1891 and 1892, under the heading "Expenses of Legislation." Presented to the Legislature, 12th May, 1893. Mr. *Waters.* (*Printed.*)

No. 87.. Return to an Order of the House of the 10th day of May, 1893, for a Return shewing the number of votes polled in favor of, and against, the Scott Act By-laws when last carried in the different Counties and Cities of this Province. Also, the number of votes polled when the same Counties or Cities repealed such By-laws, and including the vote in those Counties and Cities where the By-laws, under this Act, did not pass. Presented to the Legislature, 16th May, 1893. Mr. *Gibson* (*Huron.*) (*Not printed.*)

No. 88.. Return to an Order of the House of the tenth day of May, 1893, for a Return of all convictions under the Liquor License Act in the Riding of North Ontario during the years 1891 and 1892. Also, of all moneys paid to the License Inspector for salary and expenses during said years, distinguishing the amounts paid for salary and the amounts paid for expenses. Also, of the particulars of any fines which may have been remitted during said years. Also, of the gross amounts of money received by the inspector in his official capacity during said two years, and a detailed statement of the amounts disbursed by him during the same time, shewing to whom and for what such disbursements were made. Presented to the Legislature, 16th May, 1893. Mr. *Glendinning.* (*Not printed.*)

No. 89.. Statement of the amounts loaned to the Municipalities of the Province under the Tile, Stone and Timber Act from 1st January, 1890, to 31st December, 1892. Presented to the Legislature, 19th May, 1893. (*Printed.*)

No. 90.. Report of the Secretary and Registrar of the Province for the year 1892. Presented to the Legislature, 19th May, 1893. (*Printed.*)

No. 91.. Return to an Order of the House of the fifth day of May, 1893, for a Return of copies of all correspondence between the Government and the License Commissioners of the County of Dufferin, or any other parties, concerning the resignation of the late License Inspector for the County, Mr. Anderson. Also, for copies of all correspondence between the Government and the said License Commissioners, or other parties, concerning the appointment of the present Inspector, Mr. Dodds. Presented to the Legislature, 19th May, 1893. Mr. *Barr* (*Dufferin.*) (*Not printed.*)

No. 92.. Return to an Order of the House of the twenty-fourth day of April, 1893, for a Return giving, except that already brought down, the dates of all Crown Timber Sales from 1871, as follows: The date of sale, the number and extent of the different timber berths in square miles, and the prices obtained at each such sale, *per* square mile. Presented to the Legislature, 22nd May, 1893. Mr. *Preston.* (*Printed.*)

No. 93. Return to an Order of the House of the nineteenth day of May, 1893, for a Return shewing the number of petitions that have been presented to the House during the present Sessi n asking for a plebiscite on the temperance question from temperance societies, churches and municipal corporations, giving the numbers from each in the order named. Also, shewing the nnmbers fr:m each of the above-named bodies in favor of Provincial or other Prohibition, respectively. And the number of Petitions in favor of Bill (No. 70,) To prohibit the sale of intoxicating liquors by retail. Presented to the Legislature, 23rd May, 1893. Mr. *Field.* (*Printed.*)

ANNUAL REPORT

OF THE

UNIVERSITY OF TORONTO

1891-2,

INCLUDING THE

REPORTS OF THE UNIVERSITY AND COLLEGE COUNCILS

TOGETHER WITH

BURSAR'S STATEMENT

FOR THE YEAR ENDING JUNE 30TH.

1892.

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY.

TORONTO:
PRINTED BY WARWICK & SONS, 68 & 70 FRONT STREET WEST.
1893.

ANNUAL REPORT OF THE UNIVERSITY OF TORONTO, 1891-92.

To His Honor the Honorable GEORGE A. KIRKPATRICK LL.D.,
Lieutenant-Governor of the Province of Ontario,
Visitor of the University of Toronto.

MAY IT PLEASE YOUR HONOR:

The Chancellor, Vice-Chancellor, and members of the Senate of the University of Toronto, have the honor to present their report upon the condition and progress of the University for the year 1891-92.

The following tabulated statement of the admission to degrees, and *ad eundem statum*, and of the members who matriculated in the different Faculties from June, 1891, to June, 1892, is submitted:

Law—	
Matriculation	11
Degree of LL.B	15
Degree of LL.D	3
Medicine—	
Matriculation	47
Ad eundem statum, from the College of Physicians and Surgeons	20
Ad eundem statum, from other Universities	5
Degree of M.B	60
Degree of M.D	6
Arts—	
Matriculation	103
Ad eundem statum	4
Degree of B.A	101
Degree of M.A	9
Agriculture—	
Degree of B.S.A	7
Dentistry—	
Ad eundem statum, from the Royal College of Dental Surgeons	11
Degree of D.D.S	11
Music—	
Matriculation	2
Pharmacy—	
Ad eundem, from the Ontario College of Pharmacy	25
Degree of Phm. B	23
Engineering—	
Degree of C.E	2

During the year twelve hundred and sixty-three candidates were examined in the different Faculties, as follows:—

Faculty of Law	18
Faculty of Medicine	285
Faculty of Arts	907
Department of Agriculture	7
Department of Dentistry	16
Department of Music	3
Department of Pharmacy	25
Department of Engineering	2
	1,263

Sgd. W. MULOCK,
Vice-Chancellor.

UNIVERSITY OF TORONTO,
January, 13th, 1893.

ANNUAL REPORT OF THE COUNCIL OF THE UNIVERSITY OF TORONTO, 1891-92.

To His Honor the Honorable George A. Kirkpatrick, LL.D.,
Lieutenant-Governor of the Province of Ontario,
Visitor of the University of Toronto.

May it Please Your Honor:

The Council of the University of Toronto beg leave to present to your Honor the following report for the academic year, ending June 30th, 1892:

In accordance with the provisions of the new University Act, the University Council is now charged with the work of instruction in Arts, Law and Medicine; the subjects in the Faculty of Arts being, however, restricted to Mathematics, Physics, Mineralogy and Geology, Chemistry, Zoology, Botany, Physiology, History, Ethnology, Comparative Philology, History of Philosophy, Logic and Metaphysics, Italian and Spanish, and Political Science.

Under this arrangement the members of the teaching Faculties of Arts and Law for the past session were as follows:

STAFF, 1891-92.

Faculty of Arts.

Physics—
Professor, James Loudon, M.A.
Demonstrator, W. J. Loudon, B.A.
Fellow, C. A. Chant, B.A.

Mathematics—
Professor, Alfred Baker, M.A.
Fellow, R. Henderson, B.A.
Fellow, J. F. Howard, B.A.

Chemistry—
Professor, William Herbert Pike, M.A., Ph.D.
Demonstrator, William Lash Miller, B.A., Ph.D.
Fellow, John Munro, B.A.

Biology—
Professor, R. Ramsay Wright, M.A., B.Sc.
Fellow, E. C. Jeffrey, B.A.

Physiology—
Lecturer, A. B. Macallum, B.A., M.B., Ph.D

Mineralogy and Geology—
Professor, Edward J. Chapman, Ph.D., LL.D.
Fellow, W. G. Miller, B.A.

History and Ethnology—
Professor, Sir Daniel Wilson, LL.D., F.R.S.E.

Comparative Philology—
Professor, Maurice Hutton, M.A.

Political Economy and Constitutional History—
Professor, W. J. Ashley, M.A.
Fellow, J. M. McEvoy, B.A.

Philosophy—
Professor of Logic and Metaphysics, J. Mark Baldwin, M.A., Ph.D.
Professor of History of Philosophy, James Gibson Hume, M.A., Ph.D.
Fellow, F. Tracy, B.A.

Italian and Spanish—
Lecturer, W. H. Fraser, B.A,
Fellow, W. S. McLeay, B.A.

FACULTY OF LAW.

Political Economy and Constitutional History—
Professor, W. J. Ashley, M.A.

Roman Law, General Jurisprudence and History of English Law—
Professor, the Hon. William Proudfoot, late Justice of the Supreme Court of Judicature for Ontario.

Constitutional and International Law—
Professor, the Hon. David Mills, LL.B., Q.C., M.P.

Wrongs and their Remedies—
Honorary Lecturer, the Hon. Mr. Justice McMahon.

Constitutional Law—
Honorary Lecturer, the Hon. Edward Blake, M.A., LL.D., Q.C., M.P.

Ethics of Law—
Honorary Lecturer, the Hon. S. H. Blake, B.A., Q.C.

Civil Rights—
Honorary Lecturer, D'Alton McCarthy, Q.C., M.P.

Municipal Institutions—
Honorary Lecturer, W. R. Meredith, LL.D., Q.C., M.P.P.

Criminal Jurisprudence—
Honorary Lecturer, Britton Bath Osler, LL.B., Q.C.

Commercial and Maratime Law—
Honorary Lecturer, Z. A. Lash, Q.C.

Equity Jurisprudence—
Honorary Lecturer, Charles Moss, Q.C.

Comparative Jurisprudence of Ontario and Quebec—
Honorary Lecturer, J. J. Maclaren, LL.D., Q.C.

Of the above, Prof. Hume and Mr. W. L. Miller are new members who entered on their duties in October, 1891.

The following tables exhibit the numbers attending the Pass and Honor Lectures in University subjects :

PASS.

Subjects.	Mathematics.	Physics.	Chemistry	Biology.	Mineralogy and Geology.	Philosophy.	Political Science.	History.
Fourth year	13	17	.....	.....	....	14	22	.....
Third year	.....	27	.....	.....	.....	48	21	38
Second year	.....	70	.....	35	.....	174	.....	93
First year	208	.....	91	65	98	....	.....	.....
Totals	221	114	91	100	98	236	43	131

NOTE.—The first year lectures on Chemistry, Biology and Physics were also attended by 86 first year medical students: 22 engineers also attended the lectures on Chemistry and Physics.

HONOR.

Subjects.	Mathematics.	Physics.	Chemistry.	Biology.	Mineralogy and Geology	Philosophy.	Political Science.	History.	Italian.	Spanish.	Ethnology.
Fourth year	6	10	7	2	11	5	19	.....	13	13	19
Third year	....	12	12	8	12	15	30	30	20	20	.....
Second year	20	20	38	35	35	19	63	65	27	27	....
First year	30	.....	35	33	30	.....	.....	.....	58	.....	.....
Totals	56	42	92	78	88	39	112	95	118	60	19

NOTE.—Second year lectures on Chemistry and fourth year lectures on Biology were also attended by 73 second year medical students.

The following table exhibits the numbers taking practical work in the University Laboratories:

Laboratories.	Chemical.	Biological.	Mineralogical.	Physical.	Psychological.
Fourth year	7	2	11	8	....
Third year	12	8	12	18	12
Second year	38	35	33	.....	.....
First year	..	33	.....	....	....
Totals	57	78	56	26	12

NOTE.—In addition to the above, 86 medical students attended the Chemical and Biological Laboratories, whilst the Physical Laboratory was attended by 35 Chemistry and Natural Science students and by 50 Engineering students.

The Council desires to call the attention of your Honor, especially to the unsatisfactory condition of the departments of Chemistry and Mineralogy and Geology with regard to lecture room and Laboratory accommodation and equipment. The work of the Chemical Department is now carried on in the School of Practical Science, the Laboratory accommodation of which is so insufficient that many of the art students are unable to gain admittance, whilst the insufficiency of the lecture room is well shown by the following extract from a petition of medical students, recently presented to the council:

"Every day many students who cannot find seats may be seen sitting on the steps of the aisle or standing in the back of the room vainly trying to catch a glimpse of the experiments being performed. At these lectures also may be seen, among those standing and sitting, students trying to take notes with coats over their arms and hats in their hands, for which places cannot be found in the cloak room. To avoid these unpleasant positions, a wild rush for seats, to which all are equally entitled, daily occurs, and for quite one-quarter of the hour a struggle is in process, in which, in a sense 'might is right', which is very unpleasant for us all, and more than once our professor has refused to proceed with the lecture, and has dismissed the entire class, and thus we have the loss of the lecture and of the hour's time."

Dr. Pike has also called attention to the unsatisfactory condition of the Chemical Department, in a letter to the President of date December 22nd 1892, from which the following extract was made:

"Last year a considerable number of students were altogether excluded from the Laboratory in consequence of the want of room. The same class is excluded this year.

"I have been compelled this year to divide another class, the second year of the Department of Natural Science into two sections, so that each section gets only half the Laboratory tuition they ought to receive. This directly affects those studying for a specialist's certificate who are included in the second year of the Department of Natural Science.

"Moreover, the crowded state of the Laboratory and the consequent unhealthy condition of the atmosphere are very trying alike to student and teacher, and give rise to continual complaint by the student.

"This year the classes in Elementary Chemistry have so far exceeded the capacity of the lecture room, that, although we have provided separate tuition for upwards of 60 students of the school of Practical Science who are entitled to the University lectures, the remaining class cannot find even standing room at the lecture, and great disorder and discomfort have resulted."

In view of the foregoing facts the Council expresses the hope that immediate steps will be taken to push on the erection of the new Chemical Laboratory.

The condition of the Department of Mineralogy and Geology is also in an extremely unsatisfactory state as regards accommodation and equipment. At present the work of the department is conducted in a part of the Biological building which was designed for anatomical purposes, and as a consequence the lecture room is ill adapted for Professor Chapman's uses, whilst the insufficiency of the Laboratory accommodation and equipment is such that students get at present but a small proportion of the required instruction in practical work. The work of instruction is further impeded by the want of a museum for mineralogical and geological specimens. The sum derived from the insurance upon the collection in the old museum, the contents of which were entirely destroyed at the University fire, cannot be expended to any advantage, nor can donations of specimens from friends of the University, be expected until proper accommodation is provided for such purposes. Altogether the claims of this department, which are second to none in the University, demand the immediate attention of the authorities, and the council accordingly expresses the hope that this matter also will soon receive the consideration which its importance demands.

As regards the character of the buildings required for the wants of the departments of Chemistry and Mineralogy and Geology, the council is of opinion that plain but substantial brick structures should be erected. Lavish expenditure on such buildings is to

be deprecated not only on account of the present state of University finances, but also on account of the alterations and additions which increased numbers will render necessary at some future day.

The members of the teaching staff in medicine for the last session were as follows:

STAFF 1891-92.

Faculty of Medicine.

Professor of Practical Surgery:
W. T. Aikins, M.D., Tor., LL.D.
Professor of Clinical Surgery:
L. McFarlane M.D., Tor.
Professor of Principles of Surgery:
I. H. Cameron, M.B. Tor.
Associate Professor of Principles of Surgery and Clinical Surgery:
G. A. Peters, M.B., Tor., F.R.C.S., Eng.
Professor of Principles and Practice of Medicine:
H. H. Wright, M.D., L.C.P. & S., U.C.
Professor of Clinical Medicine and Dermatology:
J. E. Graham, M.D., Tor., L.R.C P., Eng.
Associate Professor of Clinical Medicine:
A. McPhedran M.B., Tor.
Demonstrator of Clinical Medicine:
W. P. Caven M.B., Tor.
Professor of General and Surgical Anatomy:
J. H. Richardson, M.D., Tor., M.R.C.S., Eng.
Professor of Primary Anatomy:
M. H. Aikins, B.A., M.D., Tor., M.R.C.S., Eng.
Lecturer on Topographical Anatomy and Assistant Demonstrator of Anatomy:
A. Primrose, M.B., Edin., and Tor., M.R.C.S., Eng.
Demonstrator of Anatomy:
John Ferguson, M.A., M.D., Tor., L.F.P.S., Glas., L.R.C.P., Edin.
Assistant Demonstrators of Anatomy:
T. S. Cullen, M.B., Tor.
J. T. Fotheringham, B.A., MB., Tor.
W. Harley Smith, B.A., M.B., Tor.
F. N. G. Starr, M.B., Tor.
W. B. Thistle, M.D.
Professor of Gynecology:
Uzziel Ogden, M.D.
Professor of Medical Juris prudence:
W. W. Ogden, M.D.
Professor of Sanitary Science:
W. Oldright, M.A., M.D., Tor.
Professor of Ophthalmology and Otology:
R. A. Reeve, B.A., M.D. Tor.
Clinical Lecturer in Ophthalmology and Otology:
G. H. Burnham, M.D., Tor., F.R.C.S., Edin., M.R.C.S., Eng.
Professor of Obstetrics:
A. H. Wright, B.A., M.D., Tor., M.R.C.S., Eng.
Professor of Biology:
R. Ramsay Wright, M.A., B.Sc., Edin.
Professor of Physiology:
A. B. Macallum, B.A., M.B., Tor., Ph.D., Johns Hopkins.
Demonstrator of Practical Biology:
Thomas McKenzie, B.A., M.B., Tor.

Professor of Chemistry :
W. H. Pike, M.A., Ph.D.
Professor of Applied Chemistry :
W. H. Ellis, M.A., M.B., Tor.
Professor of Physics :
James Loudon, M.A.
Demonstrator of Physics :
W. J. Loudon, B.A.
Lecturer in Physics :
A. C. McKay, B.A.
Professor of Medical Psychology :
Daniel Clark, M.D., Tor.
Lecturer in Laryngology and Rhinology :
George R. McDonagh, M.D., Tor., L.R.C.P., Lond.
Professor of Pharmacology and Therapeutics :
James M. McCallum, B.A., M.D.
Demonstrator of Materia Medica and Pharmacy :
O. R. Avison, M.D.
Professor of Pathology :
John Caven, B.A., M.D., L.R.C.P., Lond.

The total number of medical students in attendance during the session was 286, of whom 86 belonged to the first year, 73 to the second, 69 to the third, and 58 to the fourth.

With the end of the session, the term of all instructors in purely medical subjects ceased, and a reorganization of the staff was effected. Under the new scheme, the whole cost of maintaining the Medical Faculty is met by the fees received from medical students. The Arts Faculty will provide all the instruction required by medical students in chemistry, physics, biology and physiology, but the fees paid therefor will go into the general funds of the University. Excluding these fees, it is estimated that the amount available for the maintenannce of the Faculty during the next session will be about $22,000.00, of which 40 per cent. ($8,800) will be devoted to working expenses and 60 per cent. ($13,200) to salaries.

In order to secure more effective teaching in anatomy and pathology, two of the professors, namely, the Associate Professor of Anatomy and the Professor of Pathology, have been engaged to devote their time mainly to the work of instruction. For these services they are each guaranteed a salary of $1,500 a year, whilst the remaining professors are to receive amounts varying from about $300 to $750. Of the other instructors, the lecturers are to be paid at the rate of from $3 to $5 per lecture, and the demonstrators and assistant-demonstrators amounts varying from $50 to $150 per annum.

Concurrently with the reorganization of the Faculty, a successful effort was made to obtain better facilities for clinical teaching at the Toronto General Hospital. In this connection, the object has been to arrange for continuous service throughout the year of the medical and surgical representatives of the Faculty on the hospital staff, and also the appointment of assistants to the chief physicians and surgeons, with a view not only to secure better instruction for the students, but to bring about an improvement in the treatment of patients.

A prominent feature of University life which has grown out of the increasing numbers of students, is the existence of a multiplicity of societies, amongst which may be mentioned : The Literary and Scientific Society, the Women's Literary Society, the University College Glee Club, the Modern Language Club, the Classical Association, the Mathematical and Physical Society, the Natural Science Association, the various class societies and the several athletic clubs. The meetings of these societies are, for the most part, now held in the lecture-rooms of the main University building. It would be a great advantage both to the students and the Faculty if the proposed Students' Union were available for such meetings, and the Council accordingly expresses the hope that

the erection of the building in question will be undertaken at an early day. The cost of this improvement, already partially constructed in connection with the Gymnasium building, will be about $7,000.

J. LOUDON,
President.

UNIVERSITY OF TORONTO,
December, 1892.

ANNUAL REPORT OF THE COUNCIL OF UNIVERSITY COLLEGE, 1891-92

To His Honor, the Honorable GEORGE A. KIRKPATRICK, LL.D.,
Lieutenant-Governor of the Province of Ontario,
Visitor to University College.

MAY IT PLEASE YOUR HONOR:

The President and Council of University College beg leave to present to your Honor the following report for the Academic year ending January 30, 1892:

By a provision of the University Act, which took effect by a proclamation of the Lieutenant-Governor in Council, on November 12, 1890, the work of instruction assigned under the Confederation scheme to University College is now restricted to the departments of Greek, Latin, French, German, English, Oriental Languages, Moral Philosophy and Ancient History. Under this arrangement the staff for the past session was composed of the following:

STAFF, 1891-92.

President, Sir Daniel Wilson, LL.D., F.R.S.E.

Greek—
Professor, Maurice Hutton, M.A.
Lecturer, H. Rushton Fairclough, M.A.

Latin—
Lecturer, William Dale, M.A.
Lecturer, W. S. Milner, B.A.
Fellow, R. J. Bonner, B.A.

English—
Professor, W. J. Alexander, B.A., Ph.D.
Lecturer, David R. Keys, M.A.

German—
Lecturer, W. H. VanderSmissen, M.A.
Lecturer, G. H. Needler, B.A., Ph.D.
Fellow, A. M. Stewart, B.A.

French—
Lecturer, John Squair, B.A.
Lecturer, John Home Cameron, B.A.
Fellow, W. C. P. Bremner, B.A.

Oriental Languages—
Professor, J. F. McCurdy, Ph.D.
Fellow, D. W. McGee, B.A.

Ethics—
Professor, James Gibson Hume, M.A., Ph.D.
Fellow, F. Tracy, B.A.

Amongst the above are three lecturers, Messrs. Milner, Cameron and Needler, who have been added to the staff on account of the large numbers in the classes in Latin, French and German. The assistance thereby rendered has been found to be of very great

benefit, but even with these additions it is doubtful, in view of the still increasing numbers in these classes, if the work can be fairly overtaken without further assistance at an early day.

In the new Act it is further provided that students attending lectures in the above or other arts departments of University study shall, if not enrolled elsewhere, be enrolled in University College. The numbers registered in accordance with this regulation, together with others taking full or partial courses in University College, were as follows :

	4th year.	3rd year.	2nd year.	1st year.	Totals.
Matriculated	96	114	199	136	545
Non-matriculated (taking full course)	..	....	33	69	102
Non-matriculated (taking partial course)	19	13	....	....	32
Totals	115	127	232	205	679

Of these 198 came from Toronto, 469 from other parts of Ontario and 12 from places outside Ontario.

The following tables exhibit the members attending Pass and Honor lectures in University College subjects, 1891-92 :

PASS.

Subjects.	Greek.	Latin.	English.	French.	German.	Orientals.	Ancient History.
Fourth year	8	18	44	23	23	1	....
Third year	29	43	54	50	45	6	....
Second year	62	132	152	140	139	29	....
First year	50	197	238	189	167	20	121
Totals	149	390	488	402	374	56	121

HONOR.

Subjects.	Greek.	Latin.	English.	French.	German.	Orientals.
Fourth year	13	13	29	14	13	1
Third year	11	11	26	24	22	5
Second year	28	28	43	36	36	3
First year	19	19	78	68	67	....
Totals	71	71	176	142	138	9

The College Council, consisting of the professors in University College and the Dean of Residence, continue as heretofore to exercise supervision over the resident students. During the past year the numbers in residence have been 27 during the first term, and 18 during the second term. Of the former number, however, only 17, and of the latter only 13 were regular undergraduates in Arts. At the beginning of the present session M. A. T. DeLury, B.A., succeeded Professor Baker as Dean, and Samuel Barnett succeeded James Thompson as Steward At the same time the Council instituted enquiries into the condition of the residence, and decided to restrict its occupation in future to undergraduates in Arts and to members of the staff

J. LOUDON,
President.

UNIVERSITY COLLEGE,
TORONTO, December, 1892.

UNIVERSITY OF TORONTO.

Bursar's Statement shewing capital invested and Income derivable therefrom as at 30th June, 1892.

——	Investments.	Income.
	$ c.	$ c.
Debentures	372,156 27	20,052 87
Mortgages on real estate	645,984 41	37,880 33
Land sold—Balances	36,043 59	2,000 96
Bank stock	350 00	24 50
City payment		6,000 00
Rents		3,493 00
Rents University Park		8,300 00
Rents allowance by Medical Faculty for use of part of the Biological Building		1,200 00
Also share of Maintenance		700 00
Fees University and College, say		35,575 00
" deeds, etc		50 00
Interest on advance to U. C. College		2,679 58
		117,956 24

J. E. BERKELEY SMITH,
Bursar.

Bursar's Office,
Toronto, July 2nd, 1892.

No. 1.—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Disbursements on Capital Account for the year ending 30th June, 1892.

Receipts.			$ c.	Disbursements.		$ c.
Purchase Money		$1,307 95		Balance, 30th June, 1891		11,605 21
Less F. A. Benson, charges selling Port Hope lots		17 34	1,290 61	Invested in loans—		
				First mortgage, real estate	$23,270 00	
Loans repaid	$126,978 02			Add amount transferred to interest on loans *re* Bellwood	33 00	
Transferred from interest on loan *re* Mrs. Rouey	$100 00					23,303 00
Transferred from suspense, loss, Jackson loan	$400 00			Invested in debentures—		
Transferred from suspense, loss, Hammill loan	705 00			Eldon	$1,747 50	
Transferred from suspense, loss, R. Oliver loan	100 00			Blenheim	6,583 15	
	1,505 00					8,330 65
Transferred from deposits *re* P. Coutts	100 00			"Plan 101 E," expense account—		
" contingent fund *re* Evan McDonald	800 00			City Treasurer, cost of sewer, Hoskin Avenue	$1,651 00	
		2,505 00		" " " Devonshire Place	2,110 91	
		129,483 02		" " water main "	1,162 90	
Debentures redeemed—				" proportion of wages, inspector of sewer, Hoskin Avenue	16 43	
E. Luther	$277 34			W. Macdonald, costs *re* sale, A. G. Brown, lots 14 and 15	40 00	
"	143 69			*Mail* Publishing Co., advertising	9 00	
		$421 03		*Globe* " "	9 06	
Grey	$79,000 00			*World* " "	9 00	
"	1,000 00			*Empire* " "	9 00	
		80,000 00		C. H. Shanley, commission, sale lots 26 and 27 Bloor Street	235 25	
Luther		77 58				5,252 49
Port Elgin		230 00		Portion of amount expended on Museum Building charged to this account per order of the Finance Committee		68,305 89
Sandwich E	$257 87					
"	251 75					
"	129 26					
"	110 30					
"	354 00					
		1,103 18				

Drayton	229 85				
Petrolia	1,400 00				
Blenheim	423 00				
Ellice	743 00				
Hastings	15,000 00				
Nottawasaga	113 05				
Rochester	$137 12				
"	186 14				
	323 26				
		100,063 95			
Purchase money, park lots, Devonshire Place, etc		1,950 00			
Queen Street Avenue licenses—					
Wm. F. Rogers, license to front, 30 feet		150 00			
Yonge Street Avenue license—					
I. O. O. F. Hall Ass'n, license to front on Yonge Street Ave.		1,250 00	Balance, 30th June, 1892		117,390 34
		234,187 58			234,187 58

J. E. BERKELEY SMITH,
Bursar.

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BURSAR'S OFFICE,
TORONTO, 2nd July, 1892.

No. 2.—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Expenditure on Income Account for the year ending 30th June, 1892.

Receipts.	Estimate, 1892.	Actual Receipt, 1892.
	$ c.	$ c.
Interest on balance purchase moneys, old sales	798 00	716 12
Interest on balance purchase moneys, new sales, Devonshire Place and vicinity (Diminution in receipt due to failure of one purchaser to carry out contract).	1,582 40	1,147 40
Interest on Loans	35,415 33	36,148 97
Interest on Debentures (Diminution in receipt due to the redemption of a large amount of debentures shortly after the beginning of the year).	21,758 93	18,909 57
Interest on General Bank Balances	200 00	
Interest on Special Funds in Bank (Excess in receipt due to the payment by Upper Canada College of interest at 6 per cent. on overdraft during building of College; enhanced by non-settlement of accounts till after close of year).	4,563 40	11,815 42
Rents (other than park) (There falls to be deducted from the gross receipts the interest on a mortgage on York street property, $600 and charges for collecting Port Hope rent—as entered on other side. The estimate was increased in expectation of an enhancement on a renewable lease	3,375 00	3,405 99

Expenditure.	Appropriation, 1892.	Expenditure, 1892.	Over expended.	Under expended.	Expenditure, 1891.
	$ c.	$ c.	$ c.	$ c.	$ c.
Summary of Appropriations and Expenditure.					
Salaries and Pensions :—					
(*a*) Salaries, including Retirement Fund	74,019 25	73,189 61		829 64	64,003 50
(*b*) Pensions	1,144 00	1,144 00			1,220 00
Bursar's Office	881 25	903 87	22 62		840 31
Expenses re Investments	800 00	709 08		90 92	1,055 42
Examiners	5,949 10	6,576 78	627 68		6,766 25
Library, Current Account (exclusive of restoration expenses)	2,600 00	1,560 12		1,039 88	2,633 39
Telephones	105 00	104 59		41	125 00
Insurances	400 00	400 00			1,742 46
Main Building	2,900 00	2,678 53		221 47	2,869 02
Grounds	1,000 00	677 88		322 12	237 45
Chemical Department (maintenance)	450 00	389 76		60 24	234 83
Biological Buildings (maintenance of structure)	1,380 00	1,407 65	27 65		993 09
Biological Department (laboratory supplies, etc)	325 00	328 88	3 88		217 86
Physical Department (maintenance and laboratory supplies)	300 00	329 48	29 48		254 52
Mineralogical and Geological Department (maintenance)	100 00	53 83		46 17	50 27
Ethnological Museum	50 00	13 88		36 12	
Psychological Department (maintenance and supplies)	300 00	149 07		150 93	
Stationery, University	680 00	884 01	204 01		955 40
Printing, University	2,570 00	2,199 61		370 39	1,838 37
Advertising, University	75 00	92 50	17 50		140 20
Incidentals, University	100 00	134 00	34 00		100 00
Stationery, University College	100 00	47 58		52 42	258 26
Printing, University College	50 00	113 57	63 57		
Advertising, University College	50 00	42 00		8 00	24 25
Incidentals, University College	50 00	50 92	92		36 50
Medals, University College		8 50	8 50		25 65
Special advertising		30 00	30 00		
Convocation expenses		42 50	42 50		269 00
Surveys, University Park Lots		138 65	138 65		280 00
Victoria College Lease		19 00	19 00		
Repairs, South Lodge		114 87	114 87		

falling in during the year; the arbitration not being concluded, however, no rent was received under that lease before the close of the year).		
Rents, University Park	8,324 00	7,666 23
Allowance for rent for occupation by Medical Faculty of part of Biological Building	1,200 00	1,200 00
Rent, Upper Canada College Block		59 15
Fees, University and College	20,380 00	23,684 25
Fees, to go to Medical Faculty. (There falls to be deducted from the gross receipt of $23,684 25 the sum of $679 for Students' Fund (as entered on other side). The estimate of $820 to go to the Medical Faculty (representing the amount which would be payable by the University for certain portions of the work of examination gratuitously performed by professors of that Faculty) was not reached; it being found that certain of those professors were no longer eligible as examiners).	820 00	480 00
City Payment	6,000 00	6,000 00
Transfer Fees	50 00	60 00
Dividend on Bank Stock	24 50	24 50
Casual Accounts:		
Insurances re Mortgages		19 64
Pasturage		11 00
Scholarships		160 00
(Amount of cheques issued in 1889, not called for by parties entitled to them cancelled).		
Prizes, University College		15 00
(Properly belonging to last year, but not received till this year).		
	104,491 56	111,523 24

Reductions from Gross Receipts.							
Interest on Debentures:—							
Accrued interest on Blenheim debentures, paid at time of purchase	$95 67						
Bank charges for collection of debentures	23 69						
Interest on scholarship foundations written to those accounts	1,563 94						
Interest on Retirement Fund balances written to those accounts	24 41						
		1,707 71					
Interest on Bank Balances:—							
Bank charges for interest on overdraft caused by advances to Upper Canada College during erection of building	1,545 46						
Interest written to various accounts as detailed	4,443 40						
		5,988 86					
Rents:—							
Interest on mortgage, York street property, paid out of rent	600 00						
Charges for collecting rents of Port Hope lots paid to F. B. Benson, collector, etc	57 80						
		657 80					
Fees, University and College:—							
Amount transferred to Students' Fund.	679 00						
Amount transferred to Medical Faculty.	480 00						
		1,159 00					
Contingent Fund:—							
Amount written to that account		5,000 00					
		109,048 09					
Balance 30th June, 1892		2,475 15					
	96,378 60	111,523 24	1,384 83	3,228 71	87,171 00		

No. 2.—UNIVERSITY OF TORONTO.—*Continued.*

Receipts.	$ c.	To Whom Paid.	Service.	$ c.	Amount of Retirement Fund.	$ c.	$ c.
			Salaries.				
					$ c.		
Amount appropriated for year (including pensions)	75,163 25		(1) Bursar's Office.				
		J. E. Berkeley Smith	Bursar	2,200 00	150 00		
		F. A. Moure	Clerk	500 00			
		Ernest Wood	Clerk, Messenger, etc	110 00			
		Arthur Worth	Book-keeper	200 00			
				3,010 00			
			Less share of expenses paid by Upper Canada College	793 75			
				2,216 25	150 00		
			(2) Library.			2,366 25	
		Jas. Brebner	Acting Librarian	350 00			
		H. H. Langton	Librarian	517 50	54 15		
		Neil McDougall	Library Delivery Clerk	120 00			
		L. F. Anderson	do	120 00			
				1,107 50	54 15		
			(3) General, as between University and University College.			1,161 65	
		Sir Daniel Wilson	President (paid also as Professor of Modern History)	1,400 00			
		do	House rent	800 00			
		Joseph Durance	Janitor	504 00			
		do	Sunday Constable	25 00			
		George Hare	Gardener	420 00			
		do	Sunday Constable	25 00			
		T. Eversfield	Engineer	576 00			
		R. Martin	Attendant on Lavatory	208 00			
		George Trice	Fireman, snow-sweeper, etc	213 16			
		Mrs. M. Laballister	Charwoman	312 00			
		Charwomen	Scrubbing, etc	204 20			
						4,687 36	
			(4) Pensions.				
		J. M. Hirschfelder	....	1,000 00			
		George Goodwin	....	144 00			
						1,144 00	

		(5) University of Toronto, General.			
W. Mulock		Vice-Chancellor	400 00		
H. H. Langton		Registrar	503 35		
Jas. Brebner		Assistant Registrar	350 00		
E. H. Copp		Registrar's Assistant	200 00		
R. McKim		Bedel, attendant on Senate (paid also as Bedel University College	340 00		
D. B. Dick		Architect	100 00		1,893 35
		(6) Teaching Staff, University.			
		(*a*) Modern History :—			
Sir Daniel Wilson		Professor (paid also as President)	2,800 00		2,800 00
		(*b*) Political Science :—			
W. J. Ashley		Professor	2,936 25	213 75	
Hon. Wm. Proudfoot		do of Roman Law, etc	1,000 00		
Hon. David Mills		do Constitutional and International Law	1,000 00		
J. M. McEvoy		Fellow	500 00		
			5,436 25	213 75	5,650 00
		(*c*) Mathematics :—			
Alfred Baker		Professor	2,436 25	213 75	
R. Henderson		Fellow	500 00		
J. F. Howard		2nd Fellow	375 00		
			3,311 25	213 75	3,525 00
		(*d*) Physics :—			
Jas. Loudon		Professor	3,100 00	75 00	
W. J. Loudon		Demonstrator	1,573 13	76 87	
C. A. Chant		Fellow	500 00		
J. S. Plaskett		Mechanical Assistant	800 00		
A. C. McKay		Temporary Assistant Lecturer	400 00		
			6,373 13	151 87	6,525 00
		(*e*) Chemistry :—			
W. H. Pike		Professor	3,100 00	75 00	
W. Lash Miller		Demonstrator	520 00	30 00	
John Munro		Fellow	287 50		
W. A. Parks		Lecture Assistant	412 50		
John Hare		Attendant	504 00		
			4,824 00	105 00	4,929 00
		(*f*) Mineralogy and Geology :—			
E. J. Chapman		Professor	3,100 00		
W. G. Miller		Fellow	500 00		
W. J. Gorle		Attendant	200 00		
					3,800 00
Carried forward	75,163 25	*Carried forward*			

No. 2.—UNIVERSITY OF TORONTO.—*Continued.*

Receipts.	$ c.	To Whom Paid.	Service.	$ c.	Amount of Retirement Fund.	$ c.	$ c.
Brought forward.....	75,163 25		*Brought forward*.....	.....	$ c.	.....	
			Salaries.—*Continued.*				
			(6) Teaching Staff University.—*Continued.*				
			(*g*) Biology:				
		R. Ramsay Wright.....	Professor	2,961 25	213 75		
		A. B. McCallum.....	Lecturer on Physiology.....	1,573 13	76 87		
		E. C. Jeffrey.....	Fellow	500 00			
		A. Pride.....	Sub-Curator of Museum and Lecturer Attendant	524 00			
		D. J. Clark.....	Attendant and Caretaker Biological Buildings.....	480 00			
		W. Stevens	Boy, cleaner	88 00			
				6,126 38	290 62		
			(*h*) Italian and Spanish:			6,417 00	
		W. H. Fraser.....	Lecturer	1,573 13	76 87		
		W. S. McLay.....	Fellow	187 50			
		J. P. Hubbard.....	do	250 00			
				2,010 63	76 87		
			(*i*) Logic and Metaphysics:—			2,087 50	
		J. M. Baldwin.....	Professor	2,936 25	213 75		
		F. Tracey.....	Fellow in Physiology, half Logic and Metaphysics and half Ethics.....	250 00			
				3,186 25	213 75		
						3,400 00	
			(7) Teaching Staff. University College.				
			(*k*) Ethics:—				
		J. G. Hume.....	Professor	2,058 75	191 25		
		F. Tracey.....	Fellow in Philosophy, half Ethics and half Logic and Metaphysics.....	250 00			
				2,308 75	191 25		
						2,500 00	

			(*l*) Greek :—				
		M. Hutton	Professor	2,961 25	213 75		
		H. R. Fairclough	Lecturer	1,573 13	76 87		
				4,534 38	290 62		
			(*m*) Latin :—			4,825 00	
		W. Dale	Lecturer	1,567 50	82 50		
		W. S. Milner	do	570 00	30 00		
		R. J. Bonner	Fellow	500 00			
				2,637 50	112 50		
			(*n*) Oriental Literature :—			2,750 00	
		J. F. McCurdy	Professor	2,037 50	112 50		
		D. W. McGee	Fellow	437 50			
				2,475 00	112 50		
			(*o*) English :—			2,587 50	
		W. J. Alexander	Professor	2,936 25	213 75		
		D. R. Keys	Lecturer	1,573 13	76 87		
				4,509 38	290 62		
			(*p*) French :			4,800 00	
		J. Squair	Lecturer	1,573 13	76 87		
		J. H. Cameron	2nd Lecturer	570 00	30 00		
		W. C. P. Brenner	Fellow	500 00			
				2,643 13	106 87		
			(*q*) German :			2,750 00	
		W. H. Vander Smissen	Lecturer	2,000 00			
		G. H. Needler	do	570 00	30 00		
		A. M. Stewart	Fellow	500 00			
				3,070 00	30 00		
			(8) University College, General.			3,100 00	
		H. H. Langton	Registrar (paid also as Registrar University)	125 00			
		R. McKim	Bedel, attendant on Senate (paid also as Bedel, University)	510 00			
						635 00	
							74,333 61
			Balance of appropriation unexpended, written to income account, 30th June, 1892				829 64
	75,163 25						75,163 25
			Bursar's Office (exclusive of Salaries.)				
Amount of appropriation for year	881 25	The Bursar	Allowance for gas, fuel, attendance, etc		100 00		
						100 00	
Carried forward			*Carried forward*				

No. 2.—UNIVERSITY OF TORONTO.—*Continued.*

Receipts.	—	To Whom Paid.	Service.	—	Amount of Retirement Fund.	—	—
	$ c.			$ c.	$ c.	$ c.	$ c.
Brought forward			*Brought forward*				
			Stationery, Printing, Postage and Incidentals.				
Amount over expended	22 62	Rowsell & Hutchison	Stationery and printing		206 93		
		Rolph, Smith & Co	Cheque books		20 00		
		The Bursar	Disbursements for postage		160 96		
		do	Incidental petty disbursements		122 72		
		Clarkson & Cross	Services *re* special accounts		60 00		
		G. H. Wood	Copying		34 00		
		R. Walker & Sons	Carpet and linoleum		39 19		
		G. & J. Murray	Gas lamp		8 00		
		Canada Furniture Co	Hat stand		19 00		
		Edwin Merritt	Painting storm sashes for windows, kalsomining and papering		19 53		
		W. J. Hallarn	Stove pipes		6 07		
		Wm. Beers	Carpenter work		3 75		
						700 15	
			Allowance for rent of office.				
		University of Toronto	Rent		400 00		
						400 00	
							1,200 15
			Less share paid by Upper Canada College				296 28
	903 87						903 87
			Expenses *re* Investments, etc.				
Amount appropriated for year	500 00	W. Macdonald	(*a*) Law Costs:— Costs *re* D. S. Armstrong loan	20 55			
		do	do E. Macdonald	106 96			
		do	do Avenue frontages	31 56			
		do	do collections	6 66			
		do	do Senate elections	7 00			
		do	do Federation account	23 01			
		do	General account	24 43			
		do	do	18 24			

		do	Costs *re* Jacob Benson loan	20 00			
		do	do Drayton debentures	5 00			
		do	do license to I.O.O.F. to front College avenue	18 39			
		do	do John Semple loan	13 23			
		do	do completing sale Jackson farm	12 00			
		do	do renewal Cath. Monkman loan	4 00			
		do	do suit, Powley *vs.* the Bursar	81 48			
		do	do J. E. Rodwell loan	55 60			
					448 11		
		H. J. & W. A. Browne	Preparing plans *re* avenue frontage to show openings into avenue		26 00		
					474 11		
			Less amounts returned—				
			Jacob Benson $20 00				
			Miss Eliz. Dale 3 00				
			R. Watson, jr 3 50				
			Robt. Hunter 4 00				
			John Semple 13 23				
			J. E. Rothwell 55 60				
			C. Monkman 4 00				
					103 33		
			Balance of appropriation unexpended, written to income account, 30th June, 1892.				370 78
							129 22
	500 00						500 00
			(*b*) General Incidentals :—				
Amount appropriated for year	300 00	Chas. King	Commission on sale east half lot 5, concession 1, to L. H. Bennett (Hammill farm)	25 00			
Additional appropriation	30	do	Inspecting Evan Macdonald farm	10 00			
		do	do Thos. Eagle farm *re* loan	10 00			
		do	do Evan Macdonald farm	10 00			
					55 00		
		Dr. M. Stalker	do J. E. Rothwell loan		8 00		
		E. Wilde	do R. Oliver farm		26 64		
		J. C. Gilchrist	Services in connection with R. Kirkland farm		3 00		
		T. G. Gillespie	Services *re* sale of Oliver farm and other matters		70 00		
		V. B. Wadsworth	Services *re* proposition of A. Manning as to surrender University Park lot 68		10 00		
		Dr. W. Oldright	Opinion *re* Geo. Goodwin's health		5 00		
		John Hague	Assistance *re* Report Financial inquiry Commission		15 00		
		Wm. Beers	Moving fence at McMaster Hall to correct boundary line	18 00			
		do	Repairing fence, Upper Canada College block	4 32			
					22 32		
Carried forward			*Carried forward*				

No. 2.—UNIVERSITY OF TORONTO.—*Continued.*

Receipts.	—	To Whom Paid.	Service.	—	Amount of Retirement Fund.	—	—
	$ c.			$ c.	$ c.	$ c.	$ c.
Brought forward	300 30		*Brought forward*				
			Expenses *re* Investments, etc.—*Continued.*				
			(*b*) General Incidentals:—				
		John Watt	Commission on renewal Wm. Chamber's loan		5 50		
		Canadian Bank of Commerce	do collecting debentures		76 49		
		E. Wilde	Inspection Kirkland farm	10 15			
		do	do J. Newton loan	4 00			
		do	do W. H. Rutledge	5 20			
					19 35		
			Less amounts returned—				
			T. Eagle ... $10 00		316 30		
			J. E. Rothwell ... 6 00		16 00		
						300 30	
	300 30					300 30	
Amount appropriated	38 00	E. J. Hearn	(*c*) Commission on Loans:—				
		C. E. Start	*Re* John Semple loan		30 00		
			Re Mrs. Cath. Monkman loan		8 00		
	38 00					38 00	
			Examiners.				
Amount appropriated for year	5,949 10	Hon. David Mills	Fee as Examiner, Arts	60 00			
		do	do	20 00			
Additional appropriation	627 68	do	do	60 00			
					140 00		
		Hon. W. Proudfoot	do		20 00		
		G. H. Robinson	do	40 00			
		do	do	80 00			
					120 00		
		W. H. Ballard	do		25 45		
		J. McGowan	do	20 00			
		do	do	85 00			
					105 00		
		A. R. Bain	do	20 00			
		do	do	26 10			
		do	do	31 85			
		do	do	98 00			
					175 95		

A. C. McKay	do	.....	20 00			
do	do	.....	20 00		40 00	
J. E. Martin	do	.....	20 25			
do	do	.....	20 50			
do	do	.....	83 00		123 75	
W. J. Alexander	do	.....	20 00			
do	do	.....	20 00			
do	do	.....	20 00			
do	do	.....	80 00			
Rev. A. H. Reynar	do	.....	.....		140 00	
H. H. Dewart	do	.....	40 00		25 50	
do	do	.....	120 00		160 00	
T. C. L. Armstong	do	.....	20 00			
do	do	.....	22 00			
do	do	.....	80 00			
do	do	.....	20 00		140 00	
W. H. Vander Smissen	do	.....	20 00			
do	do	.....	20 00			
do	do	.....	80 00		120 00	
C. H. Needler	do	.....	20 00			
do	do	.....	80 00		100 00	
J. Squair	do	.....	40 00			
do	do	.....	40 00			
do	do	.....	80 00		160 00	
W. H. Fraser	do	.....	40 00			
do	do	.....	20 00			
do	do	.....	20 00		80 00	
E. C. Jeffrey	do	.....	20 00			
do	do	.....	20 00			
do	do	.....	140 00			
do	do	.....	18 00	(Presiding)	228 00	
J. M. McEvoy	do	.....	20 00			
do	do	.....	20 00			
do	do	.....	82 00		122 00	
A. T. Thompson	do	.....	20 00			
do	do	.....	60 00		80 00	
Carried forward			6,576 78		*Carried forward*	

No. 2.—UNIVERSITY OF TORONTO.—*Continued.*

Receipts.	—	To Whom Paid.	Service.	—	Amount of Retirement Fund.	—	—
	$ c.			$ c.	$ c.	$ c.	$ c.
Brought forward.	6,576 78		*Brought forward*				
			Examiners.—*Continued.*				
		F. G. Wait	Fee as Examiner, Arts	20 00			
		do	do	20 25			
		do	do	86 50			
					126 75		
		Prof. J. M. Baldwin	do	20 00			
		do	do	20 00			
					40 00		
		Rev. J. M. Duncan	do		20 00		
		Prof. J. F. McCurdy	do	20 00			
		do	do	20 00			
					40 00		
		Rev. F. H. Wallace	do	20 00			
		do	do	22 50			
		do	do	88 00			
					130 50		
		H. R Fairclough	do	20 00			
		do	do	20 85			
			do	60 00			
		do	do	80 00			
					180 85		
		John Petch	do	20 00			
		do	do	82 30			
					102 30		
		Rev. John Burwash	do		20 00		
		J. J. Mackenzie	do	20 00			
		do	do	20 00			
					40 00		
		W. Dale	do		20 00		
		J. C. Robertson	do	40 00			
		do	do	80 00			
					120 00		
		W. P. Mustard	do		40 00		
		Rev. P. S. Dowdall	do	20 00			
		do	do	20 00			
					40 00		

D. W. McCoy	do		40 00			
do	do	presiding	19 00			
do	do	do	16 00			
					75 00	
C. A. Chant	do				80 00	
W. S. Milner	do				80 00	
J. Henderson	do				81 12	
A. T. Delury	do				60 00	
R. Henderson	do				60 00	
D. R. Keys	do				80 00	
A. F. Chamberlain	do				80 00	
A. J. Bell	do				90 00	
J. H. Cameron	do				80 00	
W. C. P. Brenner	do		80 00			
do	do	presiding	36 00			
					116 00	
Dr. W. Oldright	do				80 00	
J. P. Hubbard	do				80 00	
D. W. Ross	do				60 00	
H. E. A. Ross	do				60 00	
T. H. Mitchell	do				62 00	
F. Tracey	do				88 60	
J. L. Scully	do				40 00	
R. J. Bonner	do				12 00	
J. J. Mackenzie	do				40 00	
Dr. G. Acheson	do	Medicine	20 00			
do	do		60 00			
					80 00	
Dr. A. Primrose	do				20 00	
Dr. F. Lee	do		20 00			
do	do		40 00			
					60 00	
Dr. H. E. Mackenzie	do		20 00			
do	do		20 00			
					40 00	
Dr. C. O'Reilly	do		10 00			
do	do		20 00			
					60 00	
E. C. Jeffrey	do		60 00			
do	do		2 40			
					62 40	
Dr. H. S. Griffin	do		10 00			
do	do		20 00			
					60 00	
Dr. W. Harley Smith	do	presiding			18 00	
Dr. A. M. Baines	do	do	10 00			
do	do	presiding	20 00			
					60 00	
Carried forward		6,576 78	*Carried forward*			

No. 2.—UNIVERSITY OF TORONTO.—*Continued.*

Receipts.	——	To Whom Paid.	Service.	——	Amount of Retirement Fund.	——	——
	$ c.			$ c.	$ c.	$ c.	$ c.
Brought forward.	6,576 78		*Brought forward*				
			Examiners.—*Continued.*				
		R. Wm. Ross	Fee as Examiner, Medicine		25 00		
		Dr. H. A. McCallum	do	20 00			
		do	do	80 00			
					100 00		
		Dr. G. Chambers	do	40 00			
		do	do	80 00			
					120 00		
		Dr. A. McKinnon	do		40 00		
		Dr. F. W. Strange	do		40 00		
		Dr. M. H. Beemer	do		40 00		
		Dr. W. N. Barnhart	do		25 00		
		Dr. G. Boyd	do		25 00		
						5,301 17	
		Judge Muir	do Law	40 60			
		do	do	41 25			
					81 85		
		J. McG. Young	do	60 00			
		do	do	60 00			
					120 00		
		Hon. Wm. Proudfoot	do		60 00		
		C. A. Chant	do presiding		6 00		
						267 85	
		John Galt	do Engineering			20 00	
		Dr. R. M. Fisher	do Dentistry	20 00			
		do	do do $20 ; expenses $12	32 00			
					52 00		
		G. A. Swann	do do		47 75		
						99 75	
		Dr. W. E. Willmot	do do		10 00		
		Dr. G. A. Peters	do do	20 00			
		do	do do	20 00			
					10 00		
		Dr. T. F. McMahon	do do	20 00			
		do	do do	20 00			
					40 00		

Dr. L. Tesky	do						20 00		
Dr. W. T. Stuart	do						20 00		
J. G. Roberts	do						30 00		
								259 75	
R. R. Bensley	do	Agriculture					41 25		
A. E. Shuttleworth	do	do					20 00		
E. E. Jeffrey	do	do					20 00		
J. A. Craig	do	do					20 00		
F. R. Heakes	do	do					20 00		
R. J. Bonner	do	do					20 00		
Dr. A. P. Coleman	do	do					20 00		
Geo. Harcourt	do	do					20 00		
Hon. Chas. Drury	do	do					20 00		
Rev. J. Perwash	do	do					36 50		
								257 75	
Chas. F. Hodgson	do	Pharmacy					79 49		
Dr. G. Chambers	do	do					20 00		
Dr. J. T. Fotheringham	do	do					20 00		
J. J. Mackenzie	do	do					20 00		
R. W. Ross, P. E	do	do					10 00		
								149 49	
S. P. Warren	do	Music					20 00		
W. E. Fairclough	do	do					20 00		
								40 00	
	do	Presiding during Examinations					21 00		
A. Crichton	do	do					5 00		
Robert Martin	do	Attendant, Arts					17 25		
Jas. Robertson	do	do					15 75		
Thos. Wasson	do	Medicine					37 50		
Wm. Martin	do	Medicine and Arts				9 00			
do	do	do				28 50	31 50		
do	do	do				3 75			
J. E. Vennell	do	do				13 50	41 25		
do	do	do				18 00			
W. J. Gradam	do	do				3 00	31 50		
do	do	do				15 00			
Geo. Goodwin	do	do					48 00		
J. Thompson	do	Arts					17 50		
H. S. Donaldson	do	do				9 00	25		
do	do	do				9 00			
do	do	do				9 00			
do	do	do				6 00			
C. Heed	do	do					33 00		
T. G. Neal	do	do					6 00		
C. J. Thomas	do	do					19 50		
							6 00		
								6576 75	

Carried forward

No. 2.—UNIVERSITY OF TORONTO.—*Continued.*

Receipts.	—	To Whom Paid.	Service.	—	Amount of Retirement Fund.	—	—
	$ c.			$ c.	$ c.	$ c.	$ c.
Brought forward.	6,576 78		*Brought forward*				
			Examiners.—*Continued.*				
		Dr. W. H. Ellis	Breakage of School of Science apparatus during Medical Examinations		10 27		
		C. M. Richardson	Moving papers in connection with examinations.		3 00		
						300 77	
	6,576 78						6,576 78
			Telephones.				
Appropriation for year	105 00	Bell Telephone Co	University, main building		30 00		
		do	Biological building		30 00		
		do	Bursar's office		44 59		
						104 59	
			Balance of appropriation unexpended written to income account, 30th June, 1892			41	
	105 00						105 00
			Library Current Account.				
Amount of appropriation for year	2,600 00	R. Friedlander & Schu	Books		222 86		
		E. G. Allen	do		274 21		
		H. Welter	do		128 45		
		Appleton & Co	do		42 00		
		Wm. Powis	do		5 00		
		F. A. Brockhaus	do		13 70		
		Dulan & Co	do		5 00		
		J. E. Bryant Co	Binding		141 51		
		Presbyterian News Co	do		15 08		
		A. H. Roffe & Co	Periodicals, $63.90c., cost of orders, etc., .45c.		64 35		
		Johns Hopkins Press	do $5, cost of order, .10c.		5 10		
		American Economic Assn.	do $4, do .10c.		4 10		
		Scribner's Sons Co.	Books		95		
		Publishers' Weekly	Periodicals, $38.18, do .45c.		38 63		
		J. D. & E. S. Dana	do $ 6, do .10c.		6 10		
		Leonard Scott Pub'g. Co	do $ 5.65, do .10c.		5 75		

		Varsity Pub'g. Co	Subscription		2 00		
		Modern Language Notes	Periodicals, $ 3, cost of order, .10c		3 10		
		Brown Bros	Binding		294 20		
		Barber & Ellis	do		26 60		
		Rowsell & Hutchison	Stationery		122 23		
		Williamson & Co	Books		6 50		
		Jas. Bain & Son	Account books		3 25		
		Rolph, Smith & Co	Lithographing		8 00		
		Office Specialty Co	Cabinet		94 00		
		J. D. Spence	Copies of papers		25 00		
		Fletcher Mnfg. Co	Brooms		2 45		
						1,560 12	
			Balance of appropriation unexpended written to income account, 30th June, 1892			1,039 88	
	2,600 00						2,600 00
			Insurances.				
Amount of appropriation for year	400 00		See details of expenditure under head of "Insurances Account."			400 00	
			(Abnormal Receipts.)				
			Main Building.				
			Maintenance, Repairs, etc.				
Amount of appropriation for year	700 00	Wm. Simpson	Carpenters' work		31 83		
		James Morrison	Repairing guage, Engineer's dept	1 98			
		do	Packing for engine	2 25			
		do	Repairing valve	2 50			
					6 73		
		Bennett & Wright	Repairing burst pipes		93 29		
		Douglas Bros	Tinsmith work		40 95		
		Elliott & Son	Re-glazing	2 80			
		do	do	1 90			
					4 70		
		J. Hovenden	do	10 40			
		do	do	3 00			
					13 40		
		R. Rennie & Son	Slating		83 60		
		E. M. Morphy, Son & Co	Repairing, clocks, etc		7 00		
		T. H. Robinson	do		2 00		
		Bell Telephone Co	Moving Telephone		50		
		John Martin	Work preparing for Convocation		6 00		
		Mrs. Geo. Hare	Washing towels		7 00		
		Fletcher Mnfg. Co	Hardware sundries		74 55		
Carried forward	700 00		*Carried forward*				

No. 2.—UNIVERSITY OF TORONTO.—*Continued.*

Receipts.	$ c.	To Whom Paid.	Service.	$ c.	Amount of Retirement Fund. $ c.	$ c.	$ c.
Brought forward	700 00		*Brought forward*				
			Main Building.—*Continued.*				
			Maintenance, Repairs, etc.—*Continued.*				
		Aikenhead & Crombie	Yale lock keys		14 00		
		Chas. Beckh & Sons	Brooms		15 10		
		Vacuum Oil Co	Engine oil		16 05		
		F. W. Unitt	Waste packing for engine room		9 43		
		Rice Lewis & Son	Graphite for engine		1 25		
		A. Thompson	Belts for carrying keys		6 00		
		Jno. Kay, Son & Co	Mats		18 00		
		R Simpson	Towels and dusters		18 24		
		Cobban Mnfg. Co	Mirror		10 00		
		Brown Bros	Waste paper baskets, ink stands and pen trays		23 40		
		Rowsell & Hutchison	Toilet paper		14 00		
		H. Tolchard	Soap		4 60		
		Mason & Risch	Hire of Piano		5 00		
			Balance of appropriation unexpended written to income account, 30th June, 1892			526 62 173 38	
	700 00						700 00
			Fuel.				
Amount of appropriation for year	1,800 00	T. Coulter	Fuel, Main Building		1,062 63		
		do	do		91 21		
Additional appropriation	3 35	do	do		598 26		
		do	Coal and wood, Y. M. C. A		51 25		
	1,803 35					1,803 35	1,803 35
			Water.				
Amount of appropriation for year	300 00	Water Works Department	Water accounts			320 12	
Additional appropriation	20 12						
	320 12		Gas.				
Amount of appropria-		Consumers' Gas Co	Accounts for gas			28 44	

tion for year.....	100 00		Balance of appropriation unexpended, written to Income account, 30th June, 1892			71 56	
	100 00						100 00
			Grounds.				
Amount of appropriation for year	1,000 00	George Lynn.....	Labor on grounds.....		112 50		
		Robt. Martin.....	do		28 50		
		R. McKim.....	To pay men for work, wages		304 15		
		Wm. Martin	Removing snow.....		6 00		
		City Engineer.....	Repairing roadway, University crescent and gravel.....		92 73		
		Wm. Simpson.....	Laying sidewalks.....		129 10		
		Geo. Pearsall.....	Repairing lawn mower		4 90		
						677 83	
			Balance of appropriation unexpended, written to Income account, 30th June, 1892..			322 12	
	1,000 00						1,000 00
			Chemical Laboratory Maintenance.				
Amount of appropriation for year	450 00	Lyman Bros. & Co.....	Chemicals	116 62			
		do	do	36 33			
		do	do	1 30			
					154 25		
		Eimer & Amend.....	Materials		20 65		
		Goodyear Rubber Co.....	Bandage gum.....		1 13		
		Warmbrum, Quilitz & Co..	Apparatus		303 17		
		J. W. Quinn & Co.....	Lecture apparatus $18.25, cost of P.O. order 20c.		18 45		
		Michie & Co.....	Sundries		1 25		
		Aikenhead & Crombie.....	Tins, wires, etc.....		12 78		
		J. Westman.....	Repairing bellows		10 50		
		S. B. Windrum	Regulating laboratory clock.....		2 50		
		Cyclostyle Co.....	Neostyle and stencil paper		17 00		
		Rowsell & Hutchison	Stationery.....		6 13		
		Mrs. John Hare	Washing towels.....		2 10		
		Canadian Express Co.....	Freight	2 70			
		do	do on apparatus	1 60			
					4 30		
		Robinson & Heath	do		35 55		
					589 76		
			Less amount paid by Prof. Pike, part of W., Q. & Co's acct.....		200 00		
						389 76	
			Balance of appropriation unexpended written to income acct., 30th June, 1892			60 24	
	450 00						450 00

No. 2.—UNIVERSITY OF TORONTO.—*Continued.*

Receipts.	—	To Whom Paid.	Service.	—	Amount of Retirement Fund.	—	—
	$ c.			$ c.	$ c.	$ c.	$ c.
			Biological Buildings Maintenance.				
Amount of appropriation for year.....	1,380 00	Joseph Yorke	Repairing boiler fire place	16 85			
		do	Fitting in coal shoot	4 00			
Additional appropriation	27 65				20 85		
		Keith & Fitzsimons	Repairing water pipes.....		15 57		
		Bennett & Wright	Repairing pipes, etc	10 44			
		do	Plumbing	42 34			
		do	do	46 63			
					99 41		
		Wm. Simpson.....	Repairs		44 79		
		Jno. Fensom	do to elevator		19 30		
		Elliott & Son.....	Reglazing		1 95		
		James Iredale	Repairing copper bath		7 00		
		Geo. F. Bostwick.....	Repairing chairs		7 50		
		H. S. Thornberry.....	do switch		14 15		
		Prof. R. Ramsay Wright ..	Petty disbursements		174 26		
		T. Coulter	Coal and wood		826 74		
		Water Works Dept.....	Accounts for water		155 41		
		Consumers' Gas Co.....	Accounts for gas		108 72		
						1,495 65	
			Less amount transferred to "salaries" being wages of W. Stevens, boy cleaner, included in above petty disbursements ...			88 00	
	1,407 65						1,407 65
			Biological Department.				
Amount of appropriation for year... ..	325 00	Lyman Bros. & Co	Materials for lectures.....	26 55			
		do	Chemicals	27 56			
Additional appropriation.....	3 88				54 11		
		Andrew Jeffrey.....	do	2 56			
		do	do	7 25			
					9 81		
		Royal Oil Co	Oil.....		4 75		
		W. H. Sparrow.....	Waxing brush		2 00		
		Inland Revenue Dept.....	Alcohol		57 87		
		Evans & Son.....	Chemicals		9 28		

		Robinson & Heath	Freight on fossils presented		11 39		
		Glover Harrison estate	Crockery		3 90		
		Wm. Simpson	Stands		16 63		
		Elliott & Son	Numbering drawers		3 50		
		E. G. Allen	Map		2 29		
		Fletcher Manf. Co	Hardware, sundries, etc	9 39			
		do	do	10 30			
					19 69		
		John Catto & Co	Scrub cloth	9 02			
		do	do etc	8 51			
					17 53		
		Rowsell & Hutchison	Stationery	17 85			
		do	do	24 28			
					42 13		
		Prof. R. Ramsay Wright	Petty disbursements	44 06			
		do	do	29 94			
					74 00		
	328 88					328 88	
			Mineralogical and Geological Department, Maintenance.				
Amount of appropriation for year	100 00	Lyman Bros. & Co	Charcoal blocks	16 43			
		do	Charcoal	5 90			
					22 33		
		Map and School Supply Co.	Burners and tubing		16 80		
		Powell & Parkinson	Marble slabs to place under assay furnaces		12 80		
		James Morrison	Tubes		1 90		
						53 83	
			Balance of appropriation unexpended, written to income acct., 30th June, 1892			46 17	
	100 00						100 00
			Ethnological Museum.				
Amount of appropriation for year	50 00	Wm. Simpson	Shelving			13 88	
			Balance of appropriation unexpended, written to income acct., 30th June, 1892			36 12	
	50 00						50 00
			Physical Laboratory Maintenance.				
Amount of appropriation fo year	300 00	Lyman Bros. & Co	Acids and chemicals		34 13		
		Aikenhead & Crombie	Zinc plates, etc		10 45		
		Thos. Dean	Brass castings		14 29		
		Dr. Rudolph Koeing	Glass tubing, prisms, rubber, porcelain, etc		80 00		
Carried forward	300 00		*Carried forward*				

No. 2.—UNIVERSITY OF TORONTO.—*Continued.*

Receipts.	—	To Whom Paid.	Service.	—	Amount of Retirement Fund.	—	—
	$ c.			$ c.	$ c.	$ c.	$ c.
Brought forward	300 00		*Brought forward*	.....	.....	.....	.....
			Physical Laboratory Maintenance.—*Continued.*				
Additional appropriation	29 48	Rowsell & Hutchison.....	Stationery, etc.....	2 30			
		do	Drawing paper	12 55			
		do	Stationery	2 98			
					17 83		
		Brown Bros.	Pencils	1 00			
		do	Mimeograph.....	17 50			
					18 50		
		F. X. Cousineau.....	Felt, etc.....	.....	3 96		
		Inland Revenue Dept.....	Comparator	.....	60 00		
		Rice Lewis & Son	Screws, drills, hardware, materials, etc.....	67 69			
		do	Files, drills, wire and iron sundries.....	9 68			
					77 37		
		Wagner, Zeidler & Co ...	Cherry board.....	.....	4 25		
		McFarlane, McKinlay & Co.	Cotton	.....	5 00		
		Michie & Co	Candles	.....	1 75		
		B. Chapman	Repairing clocks, etc	.....	1 50		
		John S. Plaskett	Sundries	.....	5 60		
						334 63	
			Less amount returned by Prof. London....	.....	.....	5 15	
	329 48						329 48
			Philosophical Department Maintenance.				
Amount of appropriation for year.....	300 00	W. J. Shaw	Assistance in Laboratory.....	.....	25 00		
		A. E. Segsworth.....	Assistance in Demonstration	16 50			
		do	do Laboratory.....	33 50			
					50 00		
		H. D. C. Hodges ...	Books	.....	4 80		
		H. Welter	Books, $3.50, P.O. order, 10c	.....	3 60		
		Geo. R. Byford	Binding	.....	6 40		
		Rowsell & Hutchison	Stationery	.....	2 48		
		Prof. J. M. Baldwin	Petty disbursements.....	.....	28 37		

		Koehler's Antiquarium	Books, $2.82, P.O. order, 10c.			2 92	
		H. Holt & Co.	Books			16 05	
		Robinson & Heath	Entry fee			1 65	
		W. A. Murray & Co.	Towels			2 00	
		James Foster	Wire			1 70	
		John Kay, Son & Co.	Matting			2 10	
		R. T. Pieper & Co.	Table			2 00	
						149 07	
			Balance of appropriation unexpended written to Income account, 30th June, 1892			150 93	
	300 00						300 00
			Stationery, University.				
Amount of appropriation for year	3,250 00	Rowsell & Hutchison	Stationery and postage stamps		130 40		
Stationery	680	do	Stationery		147 85		
Printing	2,570	do	Postage		45 15		
		do	Stationery and postage		560 61		
					884 01		
			Printing.				
Amount of appropriation to Stationery and Printing (Abnormal Receipts)	139 80	Rowsell & Hutchison	Printing, including for calendar last year	$361 80	711 02		
		do	Printing		133 28		
		do	do		21 00		
		do	do copies of Examination papers		97 41		
		do	Printing	$2,527 21	1,564 50		
		Ralph, Smith & Co.	Engraving Diplomas		37 20		
		H. H. Langton	Services in preparing calendar		75 00		
					2,639 41		
						3,523 42	
			Balance of appropriation unexpended written to Income account, 30th June, 1892			166 38	
	3,689 80						3,689 80
			Advertising University and University College.				
Amount of appropriation for year	125 00	*Empire* Printing Co.	Advertising			27 75	
Additional appropriation		Toronto *World*	do			27 75	
	9 50	*Mail* Printing Co.	do			38 25	
		Globe Printing Co.	do			36 75	
		Evening Telegram	do			4 00	
	134 50					134 50	

No. 2.—UNIVERSITY OF TORONTO—*Continued.*

Receipts.		To Whom Paid.	Service.		Amount of Retirement Fund.		
	$ c.			$ c.	$ c.	$ c.	$ c.
			Incidentals, University.				
Amount of appropriation for year	100 00	Chas. Rogers & Sons Co.	Loan of chairs for convocation		6 50		
		R. M. Williams	Engrossing resolution to Lady Macdonald	4 00			
		do	do W. H. VanderSmissen	6 00			
Additional appropriation	34 00	do	Engrossing reply to Universitatsi Dublineni	4 00			
					14 00		
		T. C. Milligan	Scrutineer at senate elections		10 00		
		D. W. McGee	Reporting senate proceedings	21 00			
		do	do	18 00			
					39 00		
		J. M. Clark	Scrutineer at senate elections		10 00		
		James Brebner	City directory	5 00			
		do	Expressage of tables	50			
					5 50		
		C. A. Chant	Reporting senate proceeding		6 00		
		W. R. Butcher	Making copies of old statutes		28 00		
		D. J. Clark	Gratuity for attendance on senate meetings		15 00		
						134 00	
	134 00						134 00
			Stationery, University College.				
Amount of appropriation for year	150 00	Rowsell & Hutchison	Stationery	17 88			
		do	do	23 40			
Additional appropriation	11 15	Geo. F. Bostwick	Crayons	6 30			
					47 58		
			Printing, University College.				
		Rowsell & Hutchison	Printing		113 57		
	161 15					161 15	
							161 15
			Incidentals, University College.				
Amount of appropria		R. M. Williams	Filling in diplomas		18 68		

tion for year	50 00	C. M. Richardson	Moving articles *re* convocation		5 50		
Additional appropriation	92	M. F. Hale & Co	Cab hire		75		
		James Brebner	Sundry petty disbursements.....		25 99		
	50 92					50 92	
							50 92
			Repairs, South Lodge.				
Amount of oppropriation for year	114 87	Bennett & Wright	Repairing, plumbing, etc		51 62		
		Douglas Bros.....	Tinsmith work		63 25		
	114 87					114 87	
							114 87
			Convocation Expenses.				
Amount of appropriation for year	42 50	J. Bayley	Services of Q. O. R. band at convocation.....		.....	42 50	
	42 50						42 50
			Special Advertising.				
		The *Mail*.....	Advertising *re* guaranteed debentures		7 50		
Amount of appropriation for year	30 00	The *Globe*	do do		7 50		
		The *World*	do do		7 50		
		The *Empire*	do do		7 50		
	30 00					30 00	
			Surveys, University Park Lots.				30 00
Amount of appropriation for year	138 65	Estate of late F. F. Passmore	Surveying, etc., in connection with laying out of lots		108 65		
		Robt. Gilmour	Valuation of lots, Devonshire Place and vicinity		30 00		
	138 65					138 65	
			Victoria College Lease.				138 65
Amount of appropriation	19 00	H. J. & W. A. Browne	Making plans of Victoria College lots			19 00	
	19 00						19 00
			Medals, Univerity College.				
Amount of appropriation	8 50	Rowsell & Hutchison	Silver medal.....			8 50	
	8 50						8 50

No. 2.—UNIVERSITY OF TORONTO.—*Concluded.*

Receipts.	—	To Whom Paid.	Service.	—	Amount of Retirement Fund.	—	—
	$ c.			$ c.	$ c.	$ c.	$ c.
			Interest on Bank Balances.				
			Amounts of interest for year ending 30th June, 1892, allowed as per report of Finance Committee, to following accounts :-				
			Building Restoration Fund		250 00		
			Library Building		1,300 00		
			Library Insurance Fund		2,000 00		
			Furniture and Utensils Restoration Fund		50 00		
			Museum Restoration Fund		140 00		
			Residence Extension Fund		23 38		
			Medical Faculty Surplus Account		534 50		
			Students' Fund and Gymnasium		59 20		
			University Club and Gymnasium		62 80		
			Vice-Chancellor's Special Account		23 52		
						4,443 40	
							4,443 40
			Upper Canada College Block.				
Hy. Jackson, privilege using fence to 18th June	14 00	The *Telegram*	Advertising for tenders Upper Canada College block			3 60	
Athletic Lacrosse Club, rent grounds	54 75	do	Advertising for tenders Upper Canada College block			6 00	
			Balance, 30th June, transferred			59 15	
	68 75						68 75

BURSAR'S OFFICE,
TORONTO, 2nd July, 1892.

J. E. BERKELEY SMITH,
Bursar.

No. 3.—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Expenditure on Abnormal Receipts Account for the year ending 30th June, 1892.

Receipts.	—	Expenditures.	Appropriation, 1892.	Expenditure 1892.	Over expended.	Under expended.
	$ c.		$ c.	$ c.	$ c.	$ c.
		Summary of Appropriations and Expenditure.				
Amount of abnormal Receipts on income account for year 1891	14,001 13	Insurances	1,600 00	2,727 55	1,127 55	
		Chemical Department, special appropriation for apparatus	888 82	480 31		408 51
		do do examination apparatus	220 00	220 00		
Amount transferred from Medical Faculty surplus account to correct error in amounts written to that account in former years, as per finance committee's report. (See entry on other side.)	7,662 34	Biological Department, apparatus for Physiological Branch	800 00			800 00
		do completion of Museum Wing	4,001 47	4,779 53	778 06	
		Physical Department, fittings of Workshop and Laboratory	1,214 17	949 13		265 04
		Mineralogical and Geological Department, fittings	750 00	727 12		22 88
		do apparatus, etc	350 00			350 00
		Psychological Department, fittings	351 00	330 65		20 35
		do instruments and apparatus for Laboratory	1,100 00	919 21		180 79
		Printing, University, calender for last year	439 80	439 80		
		Mathematical Department, apparatus	750 00	45 63		704 37
		Political Science Department, Class Room supplies	30 00			30 00
		Classical Department do do	25 00	12 00		13 00
		English Department do do	19 00			19 00
		French Department do do	43 90	38 38		5 52
		German Department do do	53 00	44 49		8 51
		Italian and Spanish Department do do	22 76	23 33	57	
		Oriental Literature Department do do	23 00	16 58		6 42
		Medical Faculty surplus account, amount transferred to correct error in amounts written to that account in former years		2,910 60		
		Balance, 30th June, 1892		6,999 16		
	21,663 47		12,681 92	21,663 47	1,906 18	3,234 39

BURSAR'S OFFICE,
Toronto, 2nd July, 1892.

J. E. BERKELEY SMITH,
Bursar.

No. 3.—UNIVERSITY OF TORONTO.—*Continued.*

Abnormal Receipts Account.

Receipts.	—	To Whom Paid.	Service	—	—	—
	$ c.			$ c.	$ c.	$ c.
			Insurance.			
Amount of appropriation for year	1,600 00	Manchester Insurance Co.	Insurance on University Building		89 14	
Transferred from "Insurances" income account	400 00	Royal Insurance Co	do		89 14	
		Liverpool and L. and Globe Insurance Co	do		89 14	
Amount transferred from Building Restoration Fund, being the sum paid (as carpenters' risk) by University and chargeable to Wagner, Zeidler & Co	300 00	Imperial Insurance Co	do		89 14	
		Ætna Insurance Co	do	4 00		
		do	do $75.73			
			Less rebate, 32.50			
				43 23		
					47 23	
Additional appropriation	1,127 55	Western Assurance Co	do	3 35		
		do	do $75.73			
			Less rebate, 33.33			
				42 40		
					45 75	
		Union Insurance Co	do		81 27	
		Scottish Union and National Insurance Co	do		81 27	
		Royal Canadian Ins. Co	do	5 55		
		do	do	75 72		
					81 27	
		Queen City Ins. Co	do	5 55		
		do	do	75 72		
					81 27	
		Hartford Ins. Co	do	5 55		
		do	do	75 72		
					81 27	
		Quebec Assurance Co	do	5 55		
		do	do	75 72		
					81 27	
		Lancashire Ins. Co	do	5 55		
		do	do	75 72		
					81 27	

		Norwich Union Ins. Society	do		5 55		
		do	do		75 72		
						81 27	
		North Brit. & Merc'l Ins. Co.	do		5 55		
		do	do		75 72		
						81 27	
		Brit. America Assn. Co.	do		5 55		
		do	do		75 72		
						81 27	
		Perth Mutual Ins. Co.	do			71 51	
		Atlas Assn. Co.	do		75 72		
				Less rebate	38 32		
						37 40	
		National Assn. Co.	do		75 72		
				Less rebate	38 32		
						37 40	
		Citizens' Ins. Co.	do		75 73		
				Less rebate	38 32		
						37 41	
		Commercial Union Ins. Co.	do			71 51	
		Eastern Assn. Co.	do		75 73		
				Less rebate	38 32		
						37 41	
		Phoenix Ins. Co., Eng.	do			75 73	
		Guardian Ins. Co.	do			75 73	
		Fire Ins. Association	do			71 51	
		Queen Ins. Co.	do			71 51	
		Mercantile Ins. Co.	do			71 51	
							1,920 87
		Royal Ins. Co.	Carpenters' risk, University Buildings			50 00	
		Phoenix Ins. Co.	do			60 00	
		Guardian Assurance Co.	do			60 00	
		Manchester Ins. Co.	do			50 00	
		Liverpool L. & Globe Ins Co.	do			50 00	
		Imperial Ins. Co.	do			50 00	
		Etna Ins. Co.	do			50 63	
		Western Assurance Co.	do			48 12	
		Glasgow & London Ins. Co.	do			30 00	
		Eastern Assurance Co	do			47 50	
		Atlas Assurance Co.	do			47 50	
		National Assurance Co.	do			47 50	
		Union Ins. Co.	do			20 00	
		Citizens' Ins. Co.	do			17 50	
		Scot. Union & National Ins. Co	do			20 00	
		Royal Canadian Ins. Co.	do			20 00	
		Queen City Ins. Co.	do			20 00	
		Hartford Ins. Co.	do			20 00	
		Quebec Assurance Co.	do			20 00	
Carried forward	3,427 55		*Carried forward*				

No. 3.—UNIVERSITY OF TORONTO.—*Continued.*

Receipts.	—	To whom paid.	Service.	—	—	—
	$ c.			$ c.	$ c.	$ c.
Brought forward	3,427 55		*Brought forward*	.....	.....	.....
			Insurance.—*Continued.*			
		Lancashire Ins. Co	Carpenter's risk, University Buildings.....	.....	20 00	
		Norwich Union Ins. Society	do	.....	20 00	
		North Brit. & Mercl. Ins. Co.	do	.....	20 00	
		British America Assn. Co..	do	.....	20 00	
						808 75
		Caledonian Ins. Co	Insurance on Biological Building.....	.....	36 95	
		Royal Ins. Co.....	do	.....	36 95	
		Manchester Ins. Co.....	do	.....	53 20	
		Western Assn. Co.....	do	.....	52 55	
		Atlas Assn. Co.....	do	.....	132 90	
		National Assn. Co.....	do	.....	73 40	
		Citizens' Ins. Co.....	do	.....	41 48	
		London Assn. Corporation..	do	.....	3 30	
		City of London Assn. Co..	do	3 95		
		do ...	do	70 00		
					73 95	
						504 68
		Caledonian Ins. Co	Carpenters' risk, Museum Building.....	.....	7 50	
		Royal Ins. Co.....	do	.....	7 50	
		Phoenix Ins. Co.....	do	.....	10 00	
						25 00
		Perth Mutual Ins. Co ...	Insurance on Library	11 55		
		do	do (books).	5 95		
					17 50	
		Commerc'l Union Ins. Co...	do do	.....	4 15	
		Hand in Hand Ins. Co.....	do do	.....	4 40	
						26 05
		Queen City Ins. Co	Insurance Univ. College Y. M. C. A	.....	.....	38 50
		Boiler Inspection Co.....	do on boiler $120, less rebate $16.30...	.....	.....	103 70
	3,427 55					3,427 55
			Chemical Laboratory Appropriation.			
Amount of appropriation for year.	888 82	C. A. Kahlbaum	Chemicals.....	.....	181 24	
		Elliott Bros	Apparatus	.....	96 48	

		James Iredale	Mounting vacuum pump, making brass tank, etc		28 75	
		Aikenhead & Crombie	Drill, etc		5 50	
		Robinson & Heath	Freight on apparatus	52 41		
		do	do	36 40		
					88 81	
		L. Oertling	Weights		21 34	
		Tor. constn. & Electric Supply Co	Switch		19 94	
		P. Freysing & Co	Corks		30 00	
		Geo. Tyler	Stands	1 75		
		do	do	6 50		
					8 25	
			Balance of appropriation unexpended written to Abnormal Receipts Acct., 30th June, 1892			480 31
						408 51
	888 82					888 82
			Chemical Examination Apparatus.			
Amount of appropriation for year	220 00	Warnebrum, Quilitz & Co	Apparatus			220 00
			Physiological Department Apparatus.			
Amount of appropriation for year	800 00		Amount of appropriation unexpended written to Abnormal Receipts Acct., 30th June, 1892			800 00
			Physical Laboratory Workshop Fittings.			
Amount of appropriation for year	1,214 17	Wagner, Zeidler & Co	Laboratory fittings	217 75		
		do	Putting up shafting	25 57		
		do	Fittings	123 00		
					366 32	
		G. T. Pendrith	Pulleys, etc		44 95	
		W. J. McGuire & Co	Plumbing and gas fitting		407 71	
		Rice Lewis & Son	Belting and grindstone stand	44 70		
		do	do	41 40		
					86 10	
		Bennett & Wright	Pipe for gas engine		13 30	
		R. J. Hovenden	Painting and glazing		10 25	
		McFarlane, Mackinley & Co	Window shades		20 50	
						949 13
			Balance of appropriation unexpended written to Abnormal Receipts Acct., 30th June, 1892			265 04
	1,214 17					1,214 17

No. 3.—UNIVERSITY OF TORONTO.—*Continued.*

Receipts.	—	To whom paid.	Service.	—	—	
	$ c.			$ c.	$ c.	$ c.
			Mineralogical and Geological Department Fittings.			
Amount of appropriation for year.	750 00	Wm. Simpson	Fittings		475 32	
		Bennett & Wright	Extending gas connections, etc	160 07		
		do	Moving assay furnaces	17 56		
					177 63	
		Chas. Rogers & Sons Co	Stools		19 80	
		Map and School Supply Co.	Blackboards		12 00	
		Aikenhead & Crombie	Hardware		26 30	
		Elliott & Son	Varnishing tables		16 07	
						727 12
			Balance of appropriation unexpended written to Abnormal Receipts Acct., 30th June, 1892.			22 88
	750 00					750 00
			Mineralogical and Geological Department, Instruments, etc.			
Amount of appropriation for year.	350 00		Amount of appropriation unexpended written to Abnormal Receipts Acct., 30th June, 1892.			350 00
			Philosophical Department Fittings.			
Amount of appropriation for year.	351 00	Wagner, Zeidler & Co.	Fittings		326 00	
		H. S. Thornberry & Co	Electric fittings		4 65	
						330 65
			Balance of appropriation unexpended written to Abnormal Receipts Acct., 30th June, 1892.			20 35
	351 00					351 00
			Philosophical Laboratory.			
Amount of appropriation for year.	1,100 00	Luigi Corino	Ergograph		35 00	
		Clay and Torbensen	Synthetic braid	75 00		

		do	Apparatus	10 00			
		do	Cost of draft	25			
		do	Gravity of cells	10 10			
		do	Apparatus, tuning fork, balance, etc. $237.75 ; P. O. orders .70	238 45			
					333 80		
		James Foster	Apparatus		12 60		
		Butland & Co	Metronomer		4 50		
		Wagner, Zeidler & Co.	Case, etc.		10 05		
		Rice Lewis & Son	Tools		6 95		
		James Brebner (Acting Librarian	Freight on apparatus paid by Library now refunded		15 67		
		Robinson & Heath	Duty and freight on scale for Prof. Baldwin	27 08			
		do	Freight on apparatus	3 28			
		do	do do	5 05			
		do	Express do	11 35			
					46 76		
			Amount expended in year 1891 charged then to appropriation of $900 from Museum Restoration Fund (which appropriation is this year returned to that fund) and charged now against this appropriation. (See account No. 5)		454 88		
							919 21
			Balance of appropriation unexpended written to Abnormal Receipts Acct., 30th June, 1892				180 79
	1,100 00						1,100 00
			Stationery and Printing, University.				
			For details of expenditure see items under heading "Stationery and Printing, University," Income Account				
Amount of appropriation for year.	439 80						439 80
			Mathematical Department.				
Amount of appropriation for year.	750 00	Troughton & Simms	Instruments		39 84		
		C. W. Irwin	Freight, etc., on instruments		5 79		
							45 63
			Balance of appropriation unexpended written to Abnormal Receipts Acct., 30th June, 1892				704 37
	750 00						750 00
			Political Science Department.				
Amount of appropriation for year.	30 00		Amount of appropriation unexpended written to Abnormal Receipts Acct., 30th June, 1892				30 00

No. 3.—UNIVERSITY OF TORONTO.—*Concluded*

Receipts.	—	To whom paid.	Service.	—	—	—
	$ c.		Classical Department.	$ c.	$ c.	$ c.
Amount of appropriation for year..	25 00	Map and School Supply Co..	Maps			12 00
			Balance of appropriation unexpended written to Abnormal Receipts Acct., 30th June, 1892			13 00
	25 00					25 00
			English Department.			
Amount of appropriation for year.	19 00		Balance of appropriation unexpended written to Abnormal Receipts Acct., 30th June, 1892			19 00
			French Department.			
Amount of appropriation for year.	43 90	J. H. Cameron	Books		1 55	
		H. Welter & Co	do		25 27	
		Rowsell & Hutchison	do		10 81	
		Map and School Supply Co..	Mounting map		75	
						38 38
			Balance of appropriation unexpended written to Abnormal Receipts Acct., 30th June, 1892			5 52
	43 90					43 90
			German Department.			
Amount of appropriation for year.	53 00	H. H. Langton (Librarian)	Books paid for by him out of Students' Acct.		33 24	
		Map and School Supply Co..	Maps		6 25	
		C. J. Merani	Coloring and marking maps		5 00	
						44 49
			Balance of appropriation unexpended written to Abnormal Receipts Acct., 30th June, 1892			8 51
	53 00					53 00

			Italian and Spanish Department.				
Amount of appropriation for year.	22 76	Map and School Supply Co.	Maps			9 00	
Additional appropriation	57	H. Welter	Books			8 00	
		Ginn & Co	do			2 82	
		G. B. Putnam's Sons	do			2 40	
		D. C. Heath & Co	do			75	
		F. A. Brockhaus	do			36	
							23 33
	23 33						23 33
			Oriental Department.				
Amount of appropriation for year.	23 00	Prof. J. F. McCurdy	Maps				16 58
			Balance of appropriation unexpended written to Abnormal Receipts Acct., 30th June, 1892				6 42
	23 00						23 00

J. E. BERKELEY SMITH,
Bursar.

Bursar's Office,
Toronto, 2nd July, 1892.

No. 4.—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Disbursements on account of Biological Laboratory Students' Apparatus Fund, for the year ending 30th June, 1892.

Receipts.	$ c.	To Whom Paid.	Service.	$ c.	$ c.	$ c.
Balance 30th June, 1891	536 63	Dr. R. Muencke	Microscopes	153 48		
Prof. R. Ramsay Wright	2,187 27	do	Apparatus	131 72		
					285 20	
Medical Faculty	9 60	Carl Zeiss	Microscopes		124 57	
		Klönne & Muller	do	80 57		
		do	Optical instruments	193 36		
					273 93	
		E. Leitz	Optical apparatus	583 33		
		do	do	398 51		
		do	Microscopes and optical apparatus	196 05		
					1,177 89	
		Map and School Supply Co	Test tubes		4 60	
		Inland Revenue Dept.	Alcohol		57 87	
		Evans & Sons	Chemicals	20 74		
		do	Material	8 24		
					28 98	
		Lyman Bros. & Co.	Chemicals		2 30	
		Dr. J. M. Shaw	Material, $24.00; order, 20c.		24 20	
		Eimer & Amend	do $14.75; do 20c.		14 95	
		H. C. Bumpus	do $33.01; draft, 25c.		33 26	
		Royal Oil Co.	Parafin wax		14 41	
		Hemming Bros. & Co.	Boxes, $27.00; slides of boxes, $42.00		69 00	
Carried forward	2,733 50		*Carried forward*			

No. 4—UNIVERSITY OF TORONTO—*Concluded.*

Receipts.	$ c.	To Whom Paid.	Service.	$ c.	$ c.	$ c.
Brought forward	2,733 50		*Brought forward*			
		J. Stevens & Son	Cover, glasses and slides	28 00		
		do	do	14 00		
					42 00	
		Abram French Co.	Jars		25 75	
		Whitall, Tatum & Co.	Glassware, $14.20; order, 20c.		14 40	
		Glover Harrison Estate	Glassware		5 20	
		W. T. Petrie	Bottle stands		5 70	
		Rowsell & Hutchison	Stationery and printing	69 40		
		do	Stationery	56 00		
					125 40	
		James Iredale	Tins, pans		13 50	
		A. Geffrey & Sons	Hardware		17 70	
		Robinson & Heath	Freight on fruit jars	9 53		
		do	Duty on microscopes and freight on apparatus.	211 93		
		do	Duty and freight on glassware, $6.00; $49.21.	55 21		
		do	Freight & duty on optical goods, $59.80; $17.70.	77 50		
					354 17	
						2,714 98
			Balance 30th June, 1892			18 52
	2,733 50					2,733 50

J. E. BERKELEY SMITH,
Bursar.

Bursar's Office,
Toronto, 2nd July, 1892.

No. 5—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Disbursements on account Museum Restoration Fund, for the year ending 30th June, 1892

Receipts.	$ c.	To Whom Paid.	Service.	$ c.	$ c.	$ c.
Balance 30th June, 1891	7,068 61	Emile Deyrolle	Anatomical specimens		154 14	
Wm. Christie, special donation for specimens for Biological Museum	250 00	R. Brendel	Specimens		100 25	
		Natural Science Establishment	Specimens of corals, $20.05 ; cost of draft, 25c.		20 30	
		Gustav Schneider	Specimens		106 80	
Transferred from Philosophical laboratory, being amount written to that account in 1891 now recouped	900 00	P. Osterloh	Zoological models		103 78	
		R. F. Damon	Specimens		98 05	
		Prof. R. Ramsay Wright	Disbursements *re* specimens for museums		74 42	
		Aug. Kuhnscherf & Gohne	Case for museum		134 53	
Transferred from interest on bank balances	146 00	Wm. Simpson	Show cases		34 10	
		Wagner, Zeidler & Co.	Show cases for museum		82 00	
Transferred from Ethnological Museum fittings	2 00	Elliott & Son	Glass, $45.36 ; shelves, $5.00 for show cases		50 36	
		Ontario Paper Box Co.	Boxes	5 20		
		do	Trays for specimens	10 80		
					16 00	
		Robinson & Heath	Freight on anatomical preparations	18 89		
		do	do natural history specimens	9 50		
		do	do do	2 10		
		do	do goods	4 35		
		do	do specimens, R. F. Damon	13 39		
		do	do models	8 93		
		do	do cases for museum	23 82		
					80 98	
		Prof. R. Ramsay Wright	do museum specimens		12 62	
		H. Welter	Packing donations		1 19	
						1,069 52
			Amount transferred to Geological Museum Specimens Acct.			250 00
			Amount transferred to Ethnological Museum Fittings			1,280 00
			Balance 30th June, 1892			5,761 09
	8,360 61					8,360 61

BURSAR'S OFFICE,
TORONTO, 2nd July, 1892.

J. E. BERKELEY SMITH,
Bursar.

No. 6.—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Disbursements on account Pathological Laboratory for the year ending 30th June, 1892.

Receipts.	$ c.	To Whom Paid.	Service.	$ c.	$ c.	$ c.
Balance 30th June, 1891	113 00	Kellogg Iron Works	Erecting balcony, etc		210 00	
Dr. M. H. Aikins, subscriptions	40 00	Bennett & Wright	Plumbing work		258 50	
Dr. Primrose, do	600 00	J. C. Scott	Lumber	38 10		
do do	28 92	do	Cupboards at Medical Building	66 00	104 10	
Dr. L. H. McFarlane do	120 00	M. O'Connor	Painting and Calsomining		250 00	
Dr. J. H. Burns, do	5 00	D. B. Dick	Architect's commission, work done at Medical Building		37 83	860 43
			Balance 30th June, 1890			46 49
	906 92					906 92

BURSAR'S OFFICE,
Toronto, 2nd July, 1892.

J. E. BERKELEY SMITH,
Bursar.

No. 7.—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Disbursements on account Contingent Fund for the year ending 30th June, 1892.

Receipts.	$ c.	To Whom Paid.	Service.	$ c.	$ c.	$ c.
Balance 30th June, 1891	16,777 35	W. Macdonald	Costs *re* Anne Brown loan	56 64		
Transferred from Income Account, being amount set aside by Standing Committee on Finance	5,000 00	do	do G. T. Jackson	60 00		
		do	do Kirkland	88 99		
		do	do Oliver	85 61		
		do	do Hammill	153 30		
					444 54	
		Mitchell & Jackson	Commission on sale of Evan Macdonald farm to R. W. Carter		133 75	
		Transferred to loans	Amount of loss on Evan Macdonald property		800 00	
		do do	Amount of loss *re* Coutts' loan		463 79	
						1,842 08
			Balance 30th June, 1892			19,935 27
	21,777 35					21,777 35

Bursar's Office,
Toronto, 2nd July, 1892.

J. E. BERKELEY SMITH,
Bursar.

No. 8.—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Disbursements on account Building Restoration Fund, for the year ending 30th June, 1892.

Receipts.	$ c.	To whom paid.	Service.	$ c.	$ c.	$ c.
Provincial Treasurer, grant towards restoration of University Building	160,000 00	Wagner, Zeidler & Co.	Balance 30th June, 1891		9,107 54	
James Morrison, for scrap metal	7 97		Carpentering and joiner work	$29,748 07		
W. J. Harris, jr., for scrap iron	10 00		Less deducted for carpenters' risk (insurance	300 00		
Kellogg Iron Works, iron beams from lavatory floor	60 00			29,448 07		
Sir Daniel Wilson, amount received from sale of portion of fence placed around University Building	26 50	do	Putting wire screens on windows of engine and boiler-room and repairing fence	63 05		
D. B. Dick, amount paid by Dominion Bridge Co. for derrick used during restoration	16 00				29,511 12	
D. Thompson, amount paid for broken stone sold to him by direction of President	15 00	W. J. McGuire & Co.	Plumbing and gasfitting	4,989 81		
W. Burrett, amount paid for broken stone sold to him by direction of President	20 00	do	Gasfittings in residence	390 95		
Amount transferred from Furniture Restoration Fund	81 52	do	Gas and electric light fixtures	3,485 87		
Amount transferred from Physical Apparatus Restoration Fund	15 85	do	Hose reel and appliances for fire protection	287 80		
Amount transferred from bank balances	250 00				9,154 43	
		Bennett & Wright	Steam heating apparatus	20,300 00		
		do	Plumbing work during restoration, stone and brick department	14 06		
		do	Heating, ventilating and electric apparatus	4,780 27		
					25,094 33	
		James Gaylord	To pay wages		18,651 82	
		do	Salary as Superintendent		1,000 00	
		R. J. Hovenden	Painting and glazing	4,734 39		
		do	Painting hose house for fire protection appliances	56 60		
					4,790 99	
		W. J. Hynes	Plastering and lathing		7,121 65	
		Kellogg Iron Works	Iron material	2,136 07		
		do	Putting in steel shutters, Registrar's room	115 58		
		do	Ladder for boiler-house	5 00		
					2,256 65	
		Douglas Brothers	Tinsmithing work		2,348 92	
Carried forward	160,502 57		*Carried forward*			

No. 8.—UNIVERSITY OF TORONTO.—*Continued.*

Receipts.	$ c.	To whom paid.	Service.	$ c.	$ c.	$ c.
Brought forward	160,502 57		*Brought forward*			
		H. S. Thornberry & Co	Electric wiring		1,953 88	
		Rice Lewis & Son	Injector	3 50		
		do	Tile floors	1,615 25		
		do	Grates, hearths, etc	123 50		
					1,742 25	
		R. Rennie & Son	Slating		1,593 95	
		Walker Morley	Brick		1,609 50	
		Holbrook & Mollington	Stone carving, corbels, etc		1,429 00	
		Aikenhead & Crombie	Hardware, sundries, etc		1,474 80	
		Edward Terry	Cement		1,272 84	
		Toronto Incandescent Elec. Light Co	Pole line	626 00		
		do do	Switches and connecting same	96 55		
		do do	Vibrating gongs, etc., for fire alarm	180 00		
					902 55	
		N. T. Lyon	Windows		542 85	
		James Oag	Sharpening tools of stonecutters, etc		433 32	
		John McDonald	Sand	344 20		
		do	Sand and gravel	75 30		
					419 50	
		Chas. Rogers Sons & Co	Senate table and chairs		350 00	
		Britnell & Co	Stone, etc		362 68	
		D. B. Dick	Balance of commission as architect		4,797 00	
		Christie Lime and Stone Co	Lime		162 00	
		Robert Williams	Lime and cement		191 60	
		J. E. Ellis & Co	Regulator clock	307 00		
		do	Electric bell, President's room	11 50		
					381 50	
		John Sheppard	Brick and tiles		197 00	
		Wm. Simpson	Carpentering	4 30		
		do	re fire protection appliances	158 53		
		do	Examination desks	427 50		
					590 33	
		A. Gardner & Co	Concrete and granite paving		300 00	
		The Rathbun Co	Blocks		110 00	
Carried forward	160,502 57		*Carried forward*			

No. 8.—UNIVERSITY OF TORONTO.—*Continued.*

Receipts.	$ c.	To whom paid.	Service.	$ c.	$ c.	$ c.
Brought forward	160,502 57		*Brought forward*			
		City Treasurer	Laying water mains from Hoskin Avenue to and around University Building	1,895 00		
		do	Fire department, fire alarm box, University Building	134 90		
		do	Laying mains to Library Building	499 22		
					2,529 12	
		J. S. Plaskett	Services as electrical expert *re* wiring		172 00	
		John Kay, Son & Co	Carpet for Senate Chamber		119 20	
		J. C. Goddard	Stone		94 58	
		T. Coulter & Co	Coal for engine, etc		82 50	
		James Gaylord	Petty disbursements		12 42	
		St. Lawrence Foundry Co	Castings		7 64	
		W. Macdonald	Costs *re* Bennett & Wright bond		4 00	
		J. G. Wilson	Steel shutters, $66; draft, 25c		66 25	
		J. W. Patterson	Fire brick		234 20	
		Joseph Yorke	Stone		90 76	
		J. & J. Taylor	Vault doors		193 50	
		Citizens' Insurance Co	Balance of premium on last year's insurance, employer's liability *re* workmen	72 08		
		do	Premium on insurance, employer's liability *re* workmen	50 00		
					122 08	
		J. R. Annett	Fire blocks		64 75	
		H. Williams	Deck roofs		184 00	
		Boyle & Richardson	Iron castings		7 20	
		Bourne & Butler	Cover for dynamo		6 00	
		Consumers' Gas Co	Putting in gas pipes		63 00	
		Galvanic Battery Works	Electric bells		9 50	
		James Morrison	Lubricator, washers, etc		3 92	
		Geo. McFarlane	Ladder		4 00	
		Chas. Collett	Making iron catches, bolts, etc	6 50		
		do	Iron bolts, etc	7 00		
					13 50	
		Sanitary Reform Excavation Co	Cleaning workmen's closet		4 00	
		Canadian Architect and Builder	Advertising sale of plant		2 00	
Carried forward	160,502 57		*Carried forward*			

No. 8.—UNIVERSITY OF TORONTO.—*Concluded.*

Receipts.	$ c.	To whom paid.	Service.	$ c.	$ c.	$ c.
Brought forward	160,050 57		*Brought forward*			
		Mail Printing Co.	Advertising sale of plant		3 05	
		Empire do	do		3 00	
		The Telegram	do		1 20	
		Globe Printing Co.	do		3 00	
			do			133,891 32
			Amount transferred to insurances, being proportion of carpenters' risk payable by Wagner, Zeidler & Co.			300 00
			Balance 30th June, 1892, transferred to Library Building Account			26,311 25
	160,502 57					160,502 57

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BURSAR'S OFFICE,
Toronto, 2nd July, 1892.

J. E. BERKELEY SMITH,
Bursar.

No. 9.—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Disbursements on Museum Building Account, for the year ending 30th June, 1892.

Receipts.		To whom Paid.	Service.			
	$ c.			$ c.	$ c.	$ c.
Amount transferred from Capital Acct. per order of the Board	68,305 89		Balance 30th June, 1891			61,590 49
Amount transferred from Abnormal Receipts Acct. per order of the Board	4,779 53	Wm. Simpson	Carpenter work	1,652 79		
		do	Fittings	1,758 54		
		do	Fencing, gate, etc	478 15		
		do	Making passage in Museum Bldg. for accommodation of Mineral Department	125 00		
						4,014 48
		Bennett & Wright	Plumbing and gasfitting		897 36	
		do	Gas fixtures		81 71	
						979 07
		W. J. McGuire & Co	Heating apparatus			667 05
		Elliott & Son	Painting and glazing		566 88	
		do	Numbering coat and hat racks, locker and other fittings		120 38	
		do	Painting fence		12 65	
		do	Door signs		11 30	
						741 21
		D. B. Dick	Architect's fees			1,307 90
		H. S. Thornberry & Co	Wiring for electric light		55 00	
		do	Electric lamps, switches and bells		281 35	
		do	Resistance box		52 05	
						388 40
		Watson Bros	Plastering			477 10
		John Fenson	Elevator			190 00
		W. D. Hutson	Slating			30 00
		J. Douglas & Co	Tinsmith work			174 16
		John Kay, Son & Co	Window shades		182 39	
		do	Carpets, mats, etc		42 10	
						224 40
		Aikenhead & Crombie	Hardware fittings and hardware			387 85
		Douglas Bros	Moving assay furnace, etc		11 00	
		do	Making door, etc., fireproof		124 58	
						165 58
		R. McKim	To pay wages to workmen			117 38
Carried forward	73,085 42	*Carried forward*				

No. 9.—UNIVERSITY OF TORONTO.—*Concluded.*

Receipts.	—	To whom paid.	Service.	—	—	—
	$ c.			$ c.	$ c.	$ c.
Brought forward	73,085 42	*Brought forward*				
		Chas. Rogers & Sons Co	Stools		107 90	
		do	Tables and chairs		27 12	
		Chas. Rogers & Sons Co	Furniture and mirror, etc		57 60	
						192 62
		Geo. F. Bostwick	Chairs		1,081 85	
		do	Stools		66 00	
						1,147 85
		The Library Bureau	Castors $85, draft 25c			85 25
		Rice Lewis & Son	Ash buckets			21 00
		Consumers' Gas Co	Gas pipes, etc			48 00
		Meyer Bros	Washing apparatus			15 00
		E. B. Axworthy	Grading			83 55
		Glover Harrison estate	Crockery furnishings			4 05
		Robinson & Heath	Balance of duty on castors			4 40
		D. B. Dick	Amount paid to Robinson & Heath for duty and freight on rubber castors			28 63
	73,085 42					73,085 42

BURSAR'S OFFICE,
TORONTO, 2nd July, 1892.

J. E. BERKELEY SMITH,
Bursar.

No. 10.—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Disbursements on Library Building Account for the year ending 30th June, 1892.

Receipts.	—	To whom paid.	Service.	—	—	—
	$ c.			$ c.	$ c.	$ c.
Balance 30th June, 1891	44,681 01	Joseph Yorke	Stone and brick work		41,700 00	
Dr. L. W. Smith, subscription towards Convocation Hall Fund applied towards Library Bldg.		Farquhar & Yorke	do		8,000 00	
		Wm. Simpson	Carpenter work		4,500 00	
		Kellogg Iron Works	Iron work		3,500 00	
	250 00	W. J. McGuire & Co	Plumbing, drains and gasfitting	600 00		
McGaw & Winnett do	250 00	do	Heating and ventilating apparatus	500 00		
Wm. Christie do	2,500 00				1,100 00	
Dr. John Hoskin do	500 00					
Kilgour Bros do	250 00	R. Rennie & Son	Slating		500 00	
Davidson & Hay do	512 50	Jos. McCausland & Son	Painting and glazing		400 00	
Mrs. Emilie Smart do	500 00	Douglas Bros	Tinsmith work		350 00	
E. B. Osler do	5,000 00	Water Works Dept	Water service connections		10 20	
H. C. Hammond, subscription	500 00	Can. Architect & Builder	Advertising re tender		2 50	
H. W. Nelson, do	50 00	Toronto *World*	do		3 75	
Wm. Mulock, do	2,500 00	*Mail* Printing Co	Advertising for tenders		3 75	
Geo. A. Cox, do	2,500 00	*Globe* do	do		3 75	
		Empire do	do		3 75	
Transferred from "Interest on Bank Balances"	1,300 00					60,077 70
			Balance 30th June, 1892			27,527 09
Transferred from Building Restoration Fund, being the amount unexpended on that account	26,311 25					
	87,604 79					87,604 79

BURSAR'S OFFICE,
TORONTO, 2nd July, 1892

J. E BERKELEY SMITH,
Bursar.

No. 11.—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Disbursements on account Library Restoration Fund (books), for the year ending 30th June, 1892.

Receipts.		To whom paid.	Service.		
	$ c.			$ c.	$ c.
Balance 30th June, 1891	9,561 01	Miss Julia Cowan	Assistance in Library		285 00
F. E. Seymour (books)	50 00	Miss G. H. Andrews	do		285 00
Munderloh & Co., Cr. of Gen'l average re books sent by S. S. "Grimm"	12 25	Miss A. McMicking	do		285 00
		E. Tozer	Porter		427 00
		Miss Ross	Assistance in Library		25 00
Toronto Orchestral Society, proceeds of concerts in aid of Library	114 56	L. F. Anderson	do		15 00
		Neil McDougall	do		2 50
		R. Friedlander & Sohn	Periodicals	87 90	
Bank of Commerce, interest allowed on Savings Bank Acct	224 28	do	Books and periodicals	935 27	
James Gill, subscription	5 00	do	Books	457 41	
					1,480 58
A. H. Young, subscription to Univ. Club and Gymnasium transferred to this Acct. at his request	10 00	E. G. Allen	Books and periodicals	613 50	
		do	Books and expenses of transmission	2,850 89	
					3,464 39
		Gauthiers, Villars et fils	Books		632 12
Prof. W. J. Ashley (per H. H. Langton) refund of amount paid to him in June, 1891, for books purchased for Library, refunded on his discovering that he had not paid for them as he supposed	14 11	H. Welter	Books and periodicals	1,913 05	
		do	Books	1,315 19	
		do	Books and binding	610 04	
					3,838 28
		F. A. Brockhaus	Books		1,698 13
		Scribners' Sons & Co	do		184 40
		Dulan & Co	do	522 54	
		do	Periodicals	30 76	
					553 30
The Librarian, amount paid by Wm. Dale for books purchased from the Library	14 75	Williamson & Co	Books		185 51
		K. F. Koehler's Antiquarium	Books and binding	133 95	
		do do	Packing and freight on books	3 77	
		do do	Books	1,010 72	
					1,148 44
Amount transferred from Library Insurance Fund, being excess of payments over receipts on Restoration Fund (books) Acct	7,271 29	Mayer & Muller	Books and binding		1,585 41
		James Baer & Co	Books		102 67
		Sotheran & Co	do		260 23
		G. P. Putnam's Sons	do $1.10, order .10		1 20
		John Squair	do		4 85
Carried forward	17,277 28	*Carried forward*			

No. 11.—UNIVERSITY OF TORONTO.—*Concluded.*

Receipts.	—	To whom paid.	Service.	—	—
	$ c.			$ c.	$ c.
Brought forward	17,277 28	*Brought forward*			
		Students' Acct. per (J. Brebner)	Books		3 85
		W. F. W. Creelman	do		14 25
		R. B. Wi ling	do		20 25
		Carswell & Co	do		26 00
		Standard Publishing Co	do		9 70
		Langmans, Green & Co	do		2 66
		Ginn & Co	do $3.40, and periodicals $9.10	12 50	
		do	do and subscription to *Journal of Archæology*	17 58	
					30 08
		Parker & Co	do		85
		David Nutt	do		12 08
		J. J. Murphy	do		7 35
		A. E. Foster	do		3 64
		Walter Barwick	do		1 50
		Publishers' Weekly	do		2 60
		Henry Holt & Co	Periodicals		2 60
		Canadian Educational Mthly	do		2 00
		Prof. R. Ramsay Wright	Set of Periodicals		75 00
		Modern Language Notes	Subscription		1 60
		American Journal of Philology	do		3 10
		Boston Society of Natural History	do		3 10
		Am. Academy of Political Social Science	do		10 10
		Am. Journal of Psychology	do		5 10
		Rowsell & Hutchison	Stationery supplies, printing cards, etc		12 35
		James Brebner	Petty disbursements		259 91
		H. H. Langton (Librarian)	do		300 06
		C. W. Irwin	Express on books		1 00
		M. Rowlinson	Cartage on books		2 60
	17,277 28				17,277 28

Bursar's Office,
Toronto, 2nd July, 1892

J. E. BERKELEY SMITH,
Bursar.

No. 12.—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Disbursements on account Furniture and Utensils Restoration Fund, for the year ending 30th June, 1892.

Receipts.	$ c.	To whom paid.	Service.	$ c.	$ c.	$ c.
Balance, 30th June, 1891	3,843 50	Geo. F. Bostwick	Lecture Room seats		2,742 00	
		Chas. Rogers & Sons Co	Furniture	807 23		
Amount transferred from "Interest on Bank Balances"	50 00	do	Newspaper fyles for Students' Reading Room	19 20		
					826 43	
		John Kay, Son & Co	Carpet	12 75		
		do	Window shades	157 80		
					170 55	
		K. J. Hovenden	Painting and glazing, Lecture Room fittings	67 50		
		do	do Students' Room do	5 50		
					73 00	
						3,811 98
			Amount transferred to Building Restoration Fund			81 52
	3,893 50					3,893 50

BURSAR'S OFFICE,
TORONTO, 2nd July, 1892.

J. E. BERKELEY SMITH,
Bursar.

No. 13.—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Disbursements on account of Medical Faculty for the year ending 30th June, 1892.

Receipts.	$ c.	To Whom Paid.	Service.	$ c.	$ c.
Balance, 30th June, 1891	1,278 02	Edward Batters	Janitor, wages 12 months		360 00
Registrar, fees	20,202 00	George Lynn	Attendant	180 00	
Dr. A. H. Wright	410 00	do	do in Anatomical Dept	90 00	
					270 00
		Dr. H. H. Wright	Prof. of Principles and Practise of Medicine, share of fees		1,095 59
		Dr. W. T. Aikins	Prof. of Practice of Surgery, share of fees		1,095 59
		Dr. John Caven	Demonstrator of Pathological Histology, share of fees	109 37	
		do	Lecture fees in Medical and Surgical Pathology	336 00	
					445 37
		Dr. W. W. Ogden	Prof. of Medical Jurisprudence, share of fees		546 87
		Dr. W. Oldright	do Hygiene, do		381 88
		Dr. M. H. Aikins	do Topographical Anatomy do		437 49
		Dr. J. H. Richardson	do Descriptive and Surgical Anatomy, share of fees		1,695 59
		Dr. O. R. Avison	Demonstrator of Materia Medica and Pharmacy, share of fees		109 37
		Dr. A. H. Wright	Prof. of Obstetrics, share of fees	546 87	
		do	Secretary of Medical Faculty	437 49	
					984 36
		Dr. U. Ogden	Prof of Gynæcology, share of fees		1,095 59
		Dr. G. R. McDonagh	Instructor in Laryngology, share of fees		109 37
		Dr. G. A. Reeve	Prof. of Opthalmology, do		218 74
		Dr. J. E. Graham	do Clinical Medicine, do		763 76
		Dr. L. McFarlane	do Clinical Surgery, do		763 76
		Dr. J. H. Cameron	do Principles of Surgery do		328 12
		Dr. J. Ferguson	Demonstrator of Anatomy, do		328 12
		Dr. H. W. Aikins	do do		109 37
		Dr. G. A. Peters	do do	109 37	
		do	Lecturer in Surgical Mechanics, salary	200 00	
					309 37
		Dr. Thos. McKenzie	Demonstrator of Anatomy, share of fees		218 74
		Dr. G. H. Burnham	Clinical Lecturer Opthalmology, etc., share of fees		109 37
		Dr. J. M. McCallum	Lecturer on Therapeutics do		300 00
		Dr. A. McPhedran	Assisstant Lecturer in Medicine, salary		300 00
		Dr. A. Primrose	Lectures in Topographical Anatomy, salary	100 00	
		do	Fees payable for Lectures, Anatomy	250 00	
					350 00
Carried forward	21,890 02		*Carried forward*		

No. 13.—UNIVERSITY OF TORONTO.—*Continued.*

Receipts.	$ c.	To whom paid.	Service.	$ c.	$ c.
Brought forward	21,890 02		*Brought forward*		
		Dr. W. P. Caven	Demonstrator of Clinical Medicine, salary		100 00
		Dr. R. R. Bensley	do Histology		200 00
		Dr. Daniel Clark	Fees payable for lectures, Medical Psychology		280 00
		Dr. J. Thorburn	Percentage of fees as retired Professor		654 62
		T. H. Middlebro	Scholarship		50 00
		J. N. Harvie	do		50 00
		C. E. Smyth	do		50 00
		H. A. Bruce	do		30 00
		E. E. South	do		30 00
		W. J. McCollum	do		30 00
		University of Toronto	Rent of portion of Biological Building occupied by Medical Faculty		1,200 00
		Toronto School of Medicine	Rent of Medical Building		1,200 00
		A. Pride	Services in Anatomical Dept		30 00
		Bell Telephone Co	Rent of Telephone, Museum Building	16 00	
		do	do School of Medicine	30 00	
					46 00
		Water Works Dept	Water accounts		168 83
		Consumers' Gas Co	Gas accounts		75 95
		T. R. Whiteside	Local Improvement Tax		11 33
		Wm. McGill & Co.	Fuel		283 25
		Bennett & Wright	Plumbing		18 46
		Withrow & Hillock	Carpenter work		148 52
		J. Clarke	Glazing	11 50	
		do	Painting and glazing	49 50	
					61 00
		Geo Boxall	Repairing furnace		52 65
		C. H. Cowen	Chemicals		148 45
		Inland Revenue Dept	Alcohol	48 89	
		do	Methylated spirits	110 25	
					159 14
		Evans & Sons	Chemicals		154 77
		W. E. Galley	Materia Medica samples		128 00
		J. Stevens & Son	Scalpels, etc	1 55	
		do	Dissecting cases	26 05	
					27 60
Carried forward	21,890 02		*Carried forward*		

No. 13.—UNIVERSITY OF TORONTO.—*Continued.*

Receipts.	—	To whom paid.	Service.	—	—
	$ c.			$ c.	$ c.
Brought forward	21,890 02		*Carried forward*		
		Smith & McGlashan	Glass percolator		3 00
		Geo. Williams	Glass shades and stands		8 50
		Douglas Bros	Pails for dissecting tables, etc		45 02
		E. & M. Lautenschlager	Apparatus		74 15
		Dr. John M. Shaw	Frogs, $12.50; order, 10c		12 60
		Emile Deyrolle	Anatomical specimens		91 70
		Chevalier Tramond	do		179 82
		R. Brendel	Specimens		38 08
		Frang J. Steger	Anatomical models		88 00
		Alex. Millard	Subjects		30 00
		J. Young	do		57 00
		J. H. Millard	do		142 80
		Blachford & Son	do		50 30
		C. Ramey	do		15 00
		Alex. Millard	Fees on subjects		35 00
		Rowsell & Hutchison	Stationery and printing	285 26	
		do	Medals	177 87	
					463 13
		Brown Bros	Stationery	6 80	
		do	Vellum tags	6 50	
					13 30
		J. E. Bryant Co	Printing copies Post Graduate lectures		133 19
		R. Friedlander & Son	Books		14 63
		John Kay, Son & Co	Oil cloth		1 50
		H. A. Collins	Crayons, chalk, brooms, etc		24 85
		A. M. Hobberlin	Uniform for Janitor		24 00
		Aikenhead & Crombie	Hardware		38 72
		W. H. Sparrow	House furnishings		31 00
		Rice Lewis & Son	Scale		5 10
		Chas. Rogers & Sons Co	Furniture		52 10
		Map and School Supply Co.	Mounting charts		18 80
		Prof. R. Ramsay Wright	Paid for material, Pathological Dept		9 60
		Michie & Co	Soap		16 35
		Firstbrook Bros	Boxes for dissecting fragments		3 00
		T. G. Rice	Wire paper baskets		3 00
Carried forward	21,890 02		*Carried forward*		

No. 13.—UNIVERSITY OF TORONTO.—*Concluded.*

Receipts.	—	To whom paid.	Service.	—	—
	$ c.			$ c.	$ c.
Brought forward	21,890 02		*Carried forward*		
		John Catto & Co	Towels and dusters		16 63
		J. E. Bryant Co.	Advertising		100 00
		Grip Printing Co	do		20 00
		Can. Educational Monthly Pub. Co	do		12 00
		Ontario Teachers' Assn	Advertisement in minutes		6 00
		Toronto *World*	Advertising		4 50
		Mail Printing Co	do		2 25
		Globe do	do		4 50
		Empire do	do		4 50
		Maritime Medical *News* ...	do		36 70
		Rev. J. W. Dow	Fee refunded		19 00
		A. Nelson (Rossin House) ..	Deficit on Annual Banquet		169 44
		Dr. A. H. Wright	Petty disbursements		50 00
		Mrs. C. Batters	Washing towels		10 89
		C. M. Richardson	Expressage		4 75
		J. Young	Removing subjects, etc		61 50
		Dr. A. H. Wright	Freight paid on apparatus		10 45
		Robinson & Heath	Freight on Anatomical specimens	11 35	
		do	do preparations	24 40	
					35 75
		Prof. R. Ramsay Wright ..	Freight on case of Models for Anatomical Dept		12 10
			Transferred to Medical Faculty Surplus Acct., being surplus for year ending 30th June, 1891		1,278 02
			Balance 30th June, 1892		793 11
	21,890 02				21,890 02

BURSAR'S OFFICE,
TORONTO, July 2nd, 1892.

J. E. BERKELEY SMITH,
Bursar.

No. 14.—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Disbursements on Bacteriological Laboratory Account for the year ending 30th June, 1892.

Receipts.	—	To Whom Paid.	Service.	—	—	—
	$ c.			$ c.	$ c.	$ c.
Amount transferred from Medical Faculty Surplus account.	1,000 00	R. Muencke	Apparatus		239 28	
		E. Leitz	Optical apparatus		250 00	
		Bennett & Wright	Filtering apparatus		11 51	
		Eimer & Amend	Chemicals		15 02	
		Map and School Supply Co.	Laboratory supplies		11 36	
		James Iredale	Iron heater	15 00		
		do	Perforated shelves	8 30		
					23 30	
		Robinson & Heath	Duty on optical goods		167 15	
		Prof. R. Ramsay Wright	Re food for animals	117 35		
		do	Disbursements for maintenance	44 13		
		do	Petty disbursements	37 57		
					199 05	
						949 67
			Balance, 30th June, 1892			50 33
	1,000 00					1,000 00

Bursar's Office,
Toronto, 2nd July, 1892.

J. E. BERKELEY SMITH,
Bursar.

No. 15.—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Disbursements on Medical Faculty Surplus Account for the year ending 30th June, 1892.

Receipts.	——	To Whom Paid.	Service.	——	——
	$ c.			$ c.	$ c.
Balance, 30th June, 1891	11,526 39	Wm. Simpson	Carpenter work (charged to this account by order of Board, 17th March, 1892.)	524 18	
Amount transferred from Medical Faculty account	1,278 02	Elliott & Son	Painting, etc	181 34	
Amount transferred from Income account	533 69	Aikenhead & Crombie	Hardware supplies, etc	38 33	
Amount transferred from abnormal receipts	2,910 60				743 85
Amount transferred from fees, University	480 00		Amount transferred to Bacteriological Laboratory		1,000 00
Amount transferred from interest on bank balances	534 50		Amount transferred to abnormal receipts, being amount written in error in former years, as per Finance Committee's report		7,662 34
Prof. R. Ramsay Wright, fees received for courses in Bacteriology	295 00		Balance, 30th June, 1892		8,152 01
	17,558 20				17,558 20

BURSAR'S OFFICE,
TORONTO, 2nd July, 1892.

J. E. BERKELEY SMITH,
Bursar

No. 16.—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Disbursements on Account University Club and Gymnasium for the year ending 30th June, 1892.

Receipts.	$ c.	To Whom Paid.	Service.	$ c.
Balance, 30th June, 1891	1,570 00		Amount paid by A. H. Young, transferred at his request to Library Restoration Fund	10 00
H. Wilberforce Aikins, subscription	25 00		Balance, 30th June, 1892	1,664 80
R. A. Pyne, subscription	10 00			
J. T. Duncan, subscription	5 00			
J. H. McCullough, subscription	2 00			
Transferred from Interest on Bank balances	62 80			
	1,674 80			1,674 80

BURSAR'S OFFICE,
TORONTO, 2nd July, 1892.

J. E. BERKELEY SMITH,
Bursar.

No. 17.—UNIVERSITY OF TORONTO.

The Bursar's Statement of Receipts and Disbursements Account Vice-Chancellor's Special Account for the year ending 30th June, 1892.

Receipts.	—	To Whom Paid.	Service.	—
	$ c.			$ c.
Balance, 30th June, 1891	588 83	A. B. Greenwood	Fees	150 00
Wm. Mulock, salary as Vice-Chancellor, 12 months	400 00	Wm. Mulock		500 00
			Balance, 30th June, 1892	361 85
Transferred from interest on bank balances	23 52			
	1,012 35			1,012 35

Bursar's Office,
Toronto, 2nd July, 1892.

J. E. BERKELEY SMITH,
Bursar.

UNIVERSITY OF TORONTO.

——	Dr.	Cr.
	$ c.	$ c.
No. 18—Suspense Account :—		
Balance 30th June, 1891	2,400 00	
Transferred to loans, loss sale G. T. Jackson farm		400 00
do do M. Hammill farm		705 00
do do R. Oliver, farm		400 00
Balance 30th June, 1892		895 00
	2,400 00	2,400 00
No. 19—Deposits :—		
Balance 30th June, 1891	200 00	
Peter Coutts, deposit account, interest purchase of farm, 16, 14, Luther.	100 00	
Transferred to interest on loans *re* Peter Coutts		200 00
do loans *re* Peter Coutts		100 00
	300 00	300 00
No. 20—Residence Extension Fund :—		
Balance 30th June, 1891	584 44	
Sir Daniel Wilson, subscription	100 00	
Transferred from interest on bank balances	23 38	
Balance 30th June, 1892		707 82
	707 82	707 82
No. 21—Library Insurance Fund :—		
Balance 30th June, 1891	52,333 33	
Transferred from interest on bank balances	2,000 00	
Transferred to Library Restoration Fund		7,271 29
Balance 30th June, 1892		47,062 04
	54,333 33	54,333 33
No. 22—Geological Museum Specimens :—		
Amount transferred from Museum Restoration Fund	250 00	
Geo. L. English & Co., specimens		116 75
Walter R. Billings, fossils		50 00
Robinson & Heath, express on specimens		2 10
Balance 30th June, 1892		81 15
	250 00	250 00
No. 23—Ethnological Museum Fittings :—		
Transferred from Museum Restoration Fund	1,280 00	
Wagner, Zeidler & Co., fittings		1,278 00
Transferred to Museum Restoration Fund		2 00
	1,280 00	1,280 00
No. 24—Students' Fund and Gymnasium :—		
Balance 30th June, 1891	1,479 77	
Transferred from University Fees	679 00	
do do interest on bank balances	59 20	
Balance 30th June, 1892		2,217 97
	2,217 97	2,217 97
No. 25—Starr Bequest :—		
Balance 30th June, 1891	1,659 54	
D. Duncanson, rent of farm	70 00	
Rowsell & Hutchison, gold medal		30 17
Balance 30th June, 1892		1,699 37
	1,729 54	1,729 54

UNIVERSITY OF TORONTO.—*Continued.*

	Dr.	Cr.
	$ c.	$ s.
No. 26—Lyle Oriental Medal :—		
Balance 30th June, 1891	130 00	
Transferred from interest on debentures	8 50	
Rowsell & Hutchison, medal		8 50
Balance 30th June, 1892		130 00
	138 50	138 50
No. 27—Blake Matriculation Scholarship :—		
Balance 30th June, 1891	1,000 00	
Hon. Edward Blake, instalments	9,000 00	
Transferred from interest on bank balances	246 00	
Balance 30th June, 1892		10,246 00
	10,246 00	10,246 00
No. 28—Blake Scholarship :—		
Balance 30th June, 1891	1,250 00	
Transferred from interest on debentures	100 00	
J. A. McLean, amount of scholarship		50 00
J. D. Phillips do		50 00
Balance 30th June, 1892		1,250 00
	1,350 00	1,350 00
No. 29—Blake Scholarship (Political Science) :—		
Balance 30th June, 1891	2,500 00	
Transferred from interest on debentures	150 00	
D. C. Ross, amount of Scholarship		75 00
E. B. Horne do		75 00
Balance 30th June, 1892		2,500 00
	2,650 00	2,650 00
No. 30—Bankers' Scholarship :—		
Balance 30th June, 1891	1,200 00	
Transferred from interest on debentures	70 00	
S. J. McLean, amount of Scholarship		70 00
Balance 30th June, 1892		1,200 00
	1,270 00	1,270 00
No. 31—Ramsay Scholarship :—		
Balance 30th June, 1891	1,009 42	
Transferred from interest on debentures	60 00	
C. A. Stewart, amount of Scholarship		30 00
J. H. Rodd do do		30 00
Balance 30th June, 1892		1,009 42
	1,069 42	1,069 42
No. 32—Wm. Mulock Scholarship :—		
Balance 30th June, 1891	2,000 00	
Transferred from interest on debentures	120 00	
F. B. Hellens, amount of Scholarship (Classics)		60 00
W. Gillespie, do (Mathematics)		60 00
Balance 30th June, 1892		2,000 00
	2,120 00	2,120 00
No. 33—Mary Mulock Scholarship :—		
Balance 30th June, 1891	2,500 00	
Transferred from interest on debentures	150 00	
Amount of H. G. Crocker, cheques cancelled, not called for	24 00	
Miss J. Street, amount of Scholarship		120 00
Balance 30th June, 1892		2,554 00
	2,674 00	2,674 00

UNIVERSITY OF TORONTO.—*Continued.*

	Dr.	Cr.
	$ c.	$ c.
No. 34—Macdonald Bursary :—		
Balance 30th June, 1891	1,000 00	
W. B. Lane, amount of Scholarship		50 00
Transferred to John Macdonald's Scholarship		950 00
	1,000 00	1,000 00
No. 35—John Macdonald Scholarship :—		
Amount transferred from Macdonald Bursary	950 00	
Executors of late Hon. John Macdonald	1,000 00	
Transferred from interest on debentures	80 00	
Balance 30th June, 1892		2,030 00
	2,030 00	2,030 00
No. 36—Prince of Wales' Scholarship :—		
Balance 30th June, 1891	900 00	
Amount of H. G. Crocker, cheque cancelled, not called for	50 00	
Amount transferred from interest on debentures	50 00	
Miss M. O'Rourke, amount of Scholarship		50 00
Balance 30th June, 1892		950 00
	1,000 00	1,000 00
No. 37—Physics Scholarship :—		
Balance 30th June, 1891	2,350 00	
Transferred from interest on debentures	145 00	
J. C. McLennan, amount of Scholarship		100 00
G. F. Hull do		45 00
Balance 30th June, 1892		2,350 00
	2,495 00	2,495 00
No. 38—Julius Rossin Scholarship :—		
Balance 30th June, 1891	1,000 00	
Transferred from interest on debentures	60 00	
O. P. Edgar, amount of Scholarship		60 00
Balance 30th June, 1892		1,000 00
	1,060 00	1,060 00
No. 39—Moss Scholarship :—		
Balance 30th June, 1891	2,000 00	
Transferred from interest on debentures	120 00	
J. H. Brown, amount of Scholarship		120 00
Balance 30th June, 1892		2,000 00
	2,120 00	2,120 00
No. 40—Daniel Wilson Scholarship :—		
Balance 30th June, 1891	2,120 00	
Transferred from interest on debentures	120 00	
A. D. Chambers, amount of Scholarship (Chemistry and Mineralogy)		60 00
W. A. Parks, do (Natural Sciences)		60 00
Balance 30th June, 1892		2,000 00
	2,120 00	2,120 00
No. 41—George Brown Scholarship :—		
Balance 30th June, 1891	1,054 82	
Amount of S. B. Leacock, cheques cancelled, not called for	60 00	
Transferred from interest on debentures	60 00	
H. S. McKellar, amount of Scholarship		60 00
Balance 30th June, 1892		1,114 82
	1,174 82	1,174 82
No. 42—George Brown, Medical Scholarship :—		
Dr. Barbour, per Sir Daniel Wilson	5,055 56	
Transferred from interest on debentures	24 44	
Balance 30th June, 1892		5,080 00
	5,080 00	5,080 00

BURSAR'S OFFICE,
TORONTO, 2nd July, 1892.

J. E. BERKELEY SMITH,
Bursar.

UNIVERSITY OF TORONTO.

The Bursar's Statement of Cash Balances as at 30th June, 1892.

Account.	Dr.	Cr.
	$ c.	$ c.
Cash	67 17	
Bank of Commerce	283,021 05	
do Medical Faculty	793 11	
Capital Acct		117,390 34
Income Acct		2,475 15
Abnormal Receipts		6,999 16
Medical Faculty Acct		793 11
Medical Faculty Surplus Acct		8,152 01
Contingent Fund		19,935 27
Suspense Acct		895 00
Library Building		27,527 09
Library Insurance Fund		47,062 04
Museum Restoration Fund		5,761 09
Geological Museum Specimens		81 15
University Club and Gymnasium		1,664 80
Students' Fund and Gymnasium		2,217 97
Residence Extension Fund		707 82
Bacteriological Laboratory Acct		50 33
Biological Laboratory Students' Apps. Fund		18 52
Pathological Laboratory		46 49
Vice-Chancellor's Special Account		361 85
Retirement Funds		2,628 53
Starr Bequest		1,699 37
Lyle Oriental Medal		130 00
Blake Matriculation Scholarship		10,246 00
do Scholarship		1,250 00
do do (Political Science)		2,500 00
Bankers' Scholarship		1,200 00
Ramsay do		1,009 42
Wm. Mulock do		2,000 00
Mary Mulock do		2,554 00
John Macdonald do		2,030 00
Prince of Wales do		950 00
Physics do		2,350 00
Julius Rossin do		1,000 00
Moss do		2,000 00
Daniel Wilson do		2,000 00
George Brown do		1,114 82
do (Medical) Scholarship		5,080 00
	283,881 33	283,881 33

J. E. BERKELEY SMITH,
Bursar.

Bursar's Office,
Toronto, 2nd July, 1892.

APPENDIX A.—UNIVERSITY OF TORONTO.

THE BURSAR'S STATEMENT of Receipts and Expenditure on Account of Investments for Upper Canada College for the Year ending 30th June, 1892, subsequently transferred to the University of Toronto.

RECEIPTS.		$ c.	EXPENDITURE.	$ c.
Balance 30th June, 1891		70,272 00	Amount of expenditure on new building site account	36,882 14
Loan on mortgage, real estate, repaid	$10,422 33		Amount of expenditure on new building account	290,931 11
Amount transferred from deposits *re* W. H. Rudolph loan	222 00		Amount standing at Dr. of gratuities account	4,400 00
		10,644 33		
Purchase money, sales of land	767 90			
Amount transferred from deposits *re* J. H. and D. J. Riley sale	40 00			
		807 90		
Debentures redeemed—				
Township of Sandwich	110 00			
" "	100 00			
" "	225 00			
" "	100 00			
" Tilbury West	118 75			
" Lennox and Addington	2,000 00			
		2,653 75		
Balance 30th June, 1892		247,834 87		
		$332,213 25		$332,213 25

J. E. BERKELEY SMITH,
Bursar.

BURSAR'S OFFICE,
TORONTO, 2nd July, 1892.

APPENDIX B.—UNIVERSITY OF TORONTO.

THE BURSAR'S STATEMENT of Receipts and Expenditure on Account of Income from Investments for Upper Canada College for the year ending 30th June, 1892.

Receipts.			To whom paid.	Service.			
"A."		$ c.	Income derived from Investments and Expenditure chargeable thereto.		$ c.	$ c.	$ c.
Balance 30th June, 1891		38,186 77	Authority.	Law Costs and Valuation Fees :—			
Interest on Mortgages	$5,389 23		W. Macdonald ... Bursar.	Costs *re* J. Coates and Mrs. Deline	165 03		
Am't transferred from deposits *re* W. H. Rudolph	76 50		" ... "	" M. H. Parker, loan	109 95		
	$5,465 73		" ... "	" sale to D. Campbell of Pye Farm	19 61		
						294 59	
			Williamson & Hough ... "	Commission on sale to Campbell		46 00	
			Robt. Millons ... "	Services *re* sale of farm, M. H. Parker, loan		57 50	
			The Bursar ... "	Expenses *re* sale of farm, Parker, loan		10 85	
Less amount paid to W. Macdonald, cost of completing sale to W. H. Rudolph of Parker Farm ... $25 00			T. G. Gillespie ... "	Valuations of lots, Tp. of Seymour, *re* sales, etc.	20 00		
			" ... "	" " " "	15 50		
			" ... "	" " " "	50 00		
Am't paid to M. H. Parker, surplus coming to him on sale of farm ... 16 70						85 50	
	$41 70		J. H. Moore ... "	" " Township of Wolford		36 00	
		5,424 03	Wm. R. Elliott ... "	Inspection of mortgaged property, J. Bresnahan, loan		3 00	
				Less amounts received :—			
Interest on Debentures	$3,875 09			W. H. Rudolph, *re* Parker farm	150 00	533 44	
Less commission charged by Bank for collection of Debentures and Coupons	11 27			Alex. McDonald, *re* Parker farm	28 30		
		3,863 82		John Love, amount of deposit paid by him on purchase of J. Coates' farm, forfeited by his not carrying out transaction, and placed to this account to defray costs of sale	160 00		
						338 30	
Interest on purchase money (sales of land)		137 15		Insurances *re* Mortgages :—			195 14
Rents		40 00	"	Excess of Expenditure over Receipts, as per separate statement No. 6			13 90
Transfer fees (*re* conveyance and transfers of land)	$11 00			Commission on Loans :—			
Less amount paid to W. Macdonald, costs of conveyance to J. M. Shannon of lot 7, N. S. March street, Toronto	3 00		R. H. Temple ... "	Commission on renewal, R. Thomson, loan			15 00
		8 00	University of Toronto ... O.C.	Bursar's Office :—			
				Share of expenses for year			1,090 03
			University of Toronto ... M.	Interest on Bank Balances :—			
				Interest on Bank account overdrawn			10,738 75
				Balance 30th June, 1892			35,606 95
		47,659 77					47,659 77

APPENDIX C.—UNIVERSITY OF TORONTO.

THE BURSAR'S STATEMENT of Receipts and Expenditure on Upper Canada College New Building Expense Account for the year ending 30th June, 1892

Receipts.	—	To whom paid.	Service.	—	—	—
	$ c.			$ c.	$ c.	$ c.
Balance 30th June, 1892, transferred to Capital Account	290,931 11		Balance 30th June, 1891			224,634 94
		Estate late John Herbert	On account of contract for building		19,089 12	
		John Hanrahan	Library fittings, sidewalks, hat cupboards, cutting for electric wires, and general carpenter work		1,537 68	
		Bennett & Wright	Steam heating, water mains, storage tanks, etc		6,801 14	
		McGuire & Bird	Plumbing and gasfitting		1,361 00	
		Douglas Bros	Galvanized iron work		103 48	
		St. Lawrence Foundry Co	Wrought iron work		849 35	
		D. McIntosh & Son	Marble slabs for air ducts		79 25	
		Alex. Clark & Son	Winter sashes		146 10	
		P. H. Jackson	Partitioning Commercial room and fitting up bank in same, etc		149 25	
		Herbert & Murphy	Door in basement		8 56	
		T. L. Hicks	Wiring		50 00	
		Toronto Incandescent Electric Light Co	Electric plant, wiring, fixtures, lamps and shades		4,015 93	
		E. Chanteloup	Electroliers		698 55	
		Keith & Fitzsimmons	"		122 95	
		Shipway Manufacturing Co	Electric gongs and bells		93 00	
		Angus Ross	Repairs to plaster after electric wiring		32 20	
		E. H. Clarke & Co	Sewer		478 00	
		Christie Lime and Stone Co	Drain pipes		50 58	
		Waterworks Department	Meter		731 32	
		Laundry Machinery and Supply Co	Laundry plant and apparatus		2,664 00	
		Gutta Percha and Rubber Manufacturing Co	Hose reel, etc		567 50	
		Toronto Rubber Co	Hose and couplings		33 00	
		E. & C. Gurney Co	Range and attachments		271 95	
		W. J. Hallarn	Tinsmithing	31 60		
		"	Tinware	28 80		
					60 40	
		Aikenhead & Crombie	Hardware		649 96	
Carried forward	290,931 11	*Carried forward*				224,634 94

APPENDIX C.—*Continued.*

Receipts.	—	To whom paid.	Service.	—	—	—
	$ c.			$ c.	$ c.	$ c.
Brought forward	290,931 11	*Brought forward*				224,694 94
		A. Gardner & Co	Granolithic pavements		1,065 00	
		John Morrison	Cobble stones, gravel, stone chips, etc		375 98	
		D. Daniels	Paving, cedar posts, etc		671 80	
		Gall, Anderson & Co	Lumber for fencing and various works		1,269 63	
		Wm. Forbes	Lumber		13 10	
		Wm. Fanning	Sodding		82 14	
		Jas. Stephens	To pay men at work on grounds		681 30	
		W. C. Mackenzie	To pay carpenters and other workmen for work on gates, fence, tank-room, women scrubbing floors, etc.		926 26	
		G. Beckway	Labor, carpentering, painting, etc		4 27	
		T. Swift	"		4 27	
		M. Hinchliff	"	16 65		
		"	"	13 83		
					30 48	
		H. E. Crate	"		7 00	
		Wm. Charlton	"		12 75	
		B. Sinclair	Soap for scrubbing floors		3 80	
		Stewart & Wood	Paint, varnish, etc		48 47	
		The A. G. Peuchen Co	"		10 26	
		M. O'Connor	Graining and varnishing woodwork		500 00	
		Rice Lewis & Son	Dormitory locks and knobs	558 00		
		"	Tiling hearths, vestibule floors, grates, etc	486 75		
					1,044 75	
		J. McCausland & Son	Transom lights		194 00	
		J. T. Aggett	Laboratory fittings		587 11	
		Chas. F. Heebner	Retort stands for Laboratory		11 10	
		George Tyler	Pneumatic troughs for Laboratory		5 30	
		H. A. Collins & Co	Toilet fixtures, etc		40 00	
		George F. Bostwick	Seating for Science Hall, furniture for reception rooms, etc		541 45	
		Chas. Rogers & Sons Co	Furniture, mantels, etc		3,933 90	
		Graybill Manufacturing Co	Desks		1,194 75	
		McFarlane, McKinley & Co	Window blinds		446 94	
		Central Prison Industries	Steel beds	1,336 00		
		"	Sheets, blankets, pillow cases, etc	532 05		
					1,868 05	
		Canada Wire Mattrass Co	Mattrasses		900 00	
		John Catto & Co	Quilts, pillows and table cloths		833 87	
		Alexander & Anderson	Cotton, towelling, etc		246 73	
		John Kay, Son & Co	Carpets, etc		429 50	

					3 92
Allan Furniture Co	Upholstering			630 19	
Toronto Silver Plate Co	Cutlery			12 67	
"	Cruets, etc				632 86
Glover Harrison Estate	Crockery				310 00
H. A. Nelson & Sons	Baskets for laundry				13 75
Williamson & Co	Celestial and terrestial globes				237 50
The Art Metropole	Easels				15 30
George Bengough	Typewriters				320 00
B. Halfpenny	Gymnasium apparatus				43 65
J. Lauder	Cart				25 00
T. G. Foster & Co	Hair, etc., for re-stuffing sofas, mattresses, etc				72 41
James Wells	Repairing furniture				117 10
Thos. Cherry	"				4 25
Fred Henry	Architect's fees				200 00
Strickland & Symons	"				2,316 89
W. C. Mackenzie	Salary as Clerk of Works			480 00	
"	Petty disbursements as Clerk of Works			26 45	
					506 45
George Robertson	Salary as Nightwatchman				77 40
Globe Printing Co	Advertising for tenders				15 00
Mail Printing Co	"				6 00
The Evening Telegram	"				6 40
The *Canadian Architect and Builder*	Advertising for tenders				5 50
Manchester Assurance Co	Premium insurance on contents of building				39 00
					68,506 61
Amount of expenditure during previous year for workmen's risk, charged then to Insurance, transferred to this account					561 77
Amount of expenditure on Gymnasium account, transferred (see items below)					1,896 15
Amount of expenditure on Gardeners' house and stable account, transferred (see items below)					241 64
Total					240,931 11

APPENDIX C.—*Concluded.*

Receipts.	—	To whom paid.	Service.	—	—	—
				$ c.	$ c.	
			Gymnasium New Building :—			
		James Stephens	To pay men for labor		112 50	
		W. C. Mackenzie	"		619 65	
		J. Morrison	Plowing for excavations		14 00	
		Gall, Anderson & Co	Lumber		1,150 00	
					1,896 15	
			Gardener's House and Stable :—			
		P. H. Jackson	Lumber for and work on building		179 15	
		C. P. R. Planing Mills Co	Lumber		18 00	
		M. Hinchliff	Carpenter work and painting		22 62	
		W. H. Roberts	Labor		21 87	
					241 64	

Bursar's Office,
Toronto, 2nd July, 1892.

J. E. BERKELEY SMITH,
Bursar.

APPENDIX D.—UNIVERSITY OF TORONTO.

THE BURSAR'S STATEMENT of Receipts and Expenditure on Insurances *re* Mortgages Upper Canada College, for the year ending 30th June, 1892.

RECEIPTS.	$ c.	EXPENDITURE.	$ c.
W. E. Adams	21 00	P. J. O'Rourke	20 00
John Nightingale	16 55	Neil Thomson	10 00
R. McNichol	7 00	John Coates	3 00
T. Smyllie	10 00	Wm. Coates	3 00
J. Lamont	1 50	J. Nightingale	15 30
Transferred from Deposits *re* W. H. Rudolph	1 50	T. Smyllie	10 00
		W. E. Durinn	5 00
		W. H. Rudolph	1 50
		Mrs. M. Tully	2 80
Excess of Expenditure over Receipts transferred to Income Account, Appendix "B."	13 90	D. Connelly	4 00
		J. Lacey	6 85
			81 45
		Less rebate, Neil Thomson	10 00
	71 45		71 45

BURSAR'S OFFICE,
TORONTO, 2nd July, 1892.

J. E. BERKELEY SMITH,
Bursar.

APPENDIX E.—UNIVERSITY OF TORONTO.

THE BURSAR'S STATEMENT of Receipts and Appropriations on Deposits Account for Upper Canada College for the year ending 30th June, 1892.

RECEIPTS.	$ c.	APPROPRIATIONS.	$ c.
J. H. & D. J. Riley, *re* purchase of parts lots 24 and 25, con. 14, Seymour	40 00	Amount appropriated to Purchase Money, *re* J. W. & D. J. Riley	40 00
		Amount appropriated to Loans Repaid, *re* W. H. Rudolph	222 00
National Assurance Co., insurance on barn destroyed by fire, W. H. Rudolph loan	300 00	Amount appropriated to Interest on Loans, *re* W. H. Rudolph	76 50
		Amount appropriated to Insurance *re* Mortgages, W. H. Rudolph	1 50
	340 00		340

BURSAR'S OFFICE,
TORONTO, 2nd July, 1892.

J. E. BERKELEY SMITH,
Bursar.

RETURN

To an Order passed by the Legislative Assembly on the 11th day of April, 1892, for a Return shewing the number of bodies received by the Inspector of Anatomy during each of the past five years from (1) Charitable Institutions, (2) Criminal Institutions and (3) all other sources in the Province. Shewing also, the number of persons who have died from natural causes in each of the above named institutions during the same period, and the number of the criminal class who had spent ten years or more in prison before dying in prison, and the number of persons who, during the same period, have died at the hands of the executioner.

J. M. GIBSON,
Secretary.

Provincial Secretary's Office,
Toronto, 28th April, 1893.

RETURN

Shewing the number of bodies received by the Inspector of Anatomy in each of the past five years (1887-1891), from (1) Charitable Institutions; (2) Criminal Institutions; (3) other sources. Also, the number of persons who have died from natural causes in these institutions during the same period; the number who have spent ten years in prison before death, and the number who have died at the hands of the executioner.

SCHEDULE.	PAGES.
No. of bodies received by Inspector of Anatomy	3
" dying in Charitable and Criminal Institutions	4
" over ten years in gaol, and of those who have been executed	5

Statement shewing the number of bodies received by the Inspector of Anatomy during each of the past five years, (1887-91), from (1) Charitable Institutions; (2) Criminal Institutions; (3) all other sources in the Province.

	Number of bodies received by the Inspector of Anatomy in				
	1887.	1888.	1889.	1890.	1891.
From (1) Charitable Institutions	36	40	48	31	34
" (2) Criminal Institutions	8	10	8	6	4
" (3) All other sources	6	1	1	1	1

Statement shewing the number of persons who have died from natural causes in the (1) Charitable Institutions and (2) Criminal Institutions of the Province during each of the past five years (1887-91).

	Number of deaths from natural causes in				
	1887.	1888.	1889.	1890.	1891.
(1)					
In Charitable Institutions :—					
Hospitals	515	582	549	660	687
Other Charitable Institutions	410	498	470	532	426
Totals	925	1080	1019	1192	1113
(2)					
In Criminal Institutions :—					
Central Prison	.....	1	1	*1	1
Common Gaols	60	69	61	63	40
Reformatories	1	3	3	1	3
Totals	61	73	65	65	44

* In 1890 there was also one death by suicide in the Central Prison.

Statement shewing (1) the number of the criminal class who had spent ten years or more in prison before dying in prison, and (2) the number of persons who, during the past five years, 1887-91, have died at the hands of the executioner.

	No.
(1) The number of persons who spent ten years or more in prison before dying in prison.....	3
(2) The number of persons who have died at the hands of the executioner during five years, 1887-91	10

RETURN

Called for by Resolution of the House of Assembly on the 9th of March, 1892 showing the estimated quantity of Pine Timber now standing upon the Crown domain of the Province and the estimated value thereof, setting the same forth as far as practicable by a description by number or otherwise of the berths upon which the same is standing, and where the territory has not been divided into timber berths, showing the localities as far as practicable, and showing the data upon which such estimates are based as far as practicable

By command,

J. M. GIBSON,
Secretary.

Provincial Secretary's Office,
Toronto, May 1st, 1893.

RETURN

Called for by Resolution of the House of Assembly on the 9th of March, 1892, showing the estimated quantity of Pine Timber now standing upon the Crown domain of the Province and the estimated value thereof, setting the same forth as far as practicable by a description by number or otherwise, of the berths upon which the same is standing, and where the territory has not been divided into timber berths showing the localities as far as practicable and shewing data upon which such estimates are based as far as practiable.

Estimated Quantity.

No estimate has been made of the quantity of pine timber standing on the whole Crown domain. There is a great stretch of territory lying north of the 48th parallel of latitude and the northern limit of Ontario, and between 85 west longitude and the easterly limit of the disputed territory in respect of which no estimate has been made at all, containing 89,000 square miles or thereabouts, much of which it is known is not pine-bearing, but other portions are, and as to some other parts there is no information. What has been done is to take certain areas known to be pine bearing and apply a reasonable estimate to them, as below :

West of the Ottawa River and north-west of the limits sold in 1872, between 80 and 85 W. longitude and extending north to the 48th parallel of latitude	24,000	Square miles.
Between Ottawa agency and sale of 1881 in the Nipissing District	410	"
	24,410	"
To this area an average of one million feet board measure to the mile was applied	24,410,000,000	feet B. M.
Colonel Dennis, late Deputy Minister of the Interior, estimated the timber in the disputed territory at	26,000,000,000	"
	50,410,000,000	"
There is now subject to license in Ontario about 20,000 square miles, which has been estimated to contain half a million feet to the mile, equalling	10,000,000,000	"
This gives a total on the territory estimated of exclusive of the territory of which no attempt at an estimate has been made, as above stated.	60,410,000,000	"

Value.

The bonus value of 50,410,000,000 feet at $1.50 a thousand, equals	$75,615,000 00
The dues upon this at $1 a thousand	50,410,000 00
	$126,025,000 00
Add for duty on 10,000,000,000 feet estimated on licensed lands at $1 a thousand	$10,000,000 00
	$136,025,000 00

LOCALITY.

The locality where the timber estimated is to be found is, so far as the unlicensed territory is concerned, west of the Ottawa River and north-west of the limits sold in 1872, between 80 and 85 W. longitude and extending north to 48th parallel of latitude, 24,000 square miles. The berths, townships and localities subject to license are shown in detail on the attached statements.

DATA.

The estimate was made in 1887 by the officers of the Department of Crown Lands after consultation. The territory north of that sold in 1872 had been penetrated in a great many directions by surveyors, forest rangers, timber explorers, mining explorers, and others, who from time to time had stated to officers of the Department and through the papers, the localities in which they had seen pine timber to a sufficient extent to warrant the region estimated being classed as pine bearing, and a reasonable average was applied to that area, so as to give a rough estimate of the quantity of pine which it was expected would be there, subject of course to some variations and to decrease through destruction by fire. The estimate put upon the territory is not a high one, one million feet to the mile, which is about three average trees to the acre. It is not of course considered that all the territory is timbered, but the average put upon it is thought to be a reasonable one. The estimate of the disputed territory is that given by Mr. J. Stoughton Dennis, late Deputy Minister of the Interior, who no doubt based his opinion on what he had seen and heard from others who had been through portions of it, analogous data to that applied to the older parts of the Province. The total estimate for the Province leaves out of account 89,000 square miles, not because there is no timber on it, for reports warrant the belief that at different points there is a good deal of timber, but because no such exploration or examination has been made by anybody as would warrant the formation of any opinion as to what it would produce.

Since this estimate was made, there has become payable to the Department for timber cut on territory under license, from 1887 to 1892 inclusive, four millions and a quarter of dollars or thereabouts, the equivalent of 4,250,000,000 feet board measure of timber, which would still leave on the licensed territory 5,750,000,000 feet B. M., but it is believed that this estimate is considerably below what the licensed area will produce, and the 10,000,000,000 feet B. M. estimated as on territory subject to license in 1887 was much below the quantity then on this territory. From the 26,000,000,000 feet B. M. estimated by Colonel Dennis as being on the disputed territory, there must be deducted about 122,000,000 feet B. M. cut under authority of the Department since 1884, and the additional quantity cut in that territory under authority of the Government of Canada, as to which we have no satisfactory data.

Some explorations and estimates have been made for the different sales, and some exploring, estimating and exploratory surveying have been done in the disputed territory since the sale of 1890 not affected by the sale, but no explorations of a general character have been made in that territory upon which an estimate could be founded. The general statement of Colonel Dennis made prior to 1887 was, as before stated, incorporated with the partial and rough estimate made in 1887 and afterwards used in the House by the late and present Commissioners and Treasurer Ross.

As to the quantities remaining on berths upon which operations have for many or few years been carried on, the Department is not in possession of data to warrant a definite estimate as to particular berths. The changes caused by cutting and fire and those caused by growth from year to year would make it impossible for the Department to express even an opinion beyond that already given.

AUBREY WHITE,
Assistant Commissioner.

DEPARTMENT OF CROWN LANDS,
TORONTO, May 1st, 1893.

WESTERN AGENCY.

Berths and Localities Subject to License.

(The numbered Berths are those on the north shore of Lake Huron.)

Berth No. 2, north shore, lake Huron.
" 12, " "
Severn Islands.
Islands in Severn river.
Township of Matchedash.
" Morrison.
" Muskoka.
" Ridout
" Ryde.
" Draper.
" Vespra.
" Tiny.
" North Orillia.
" Sherbourne.
" Wood.
" Baxter.
" Gibson.
" Harrison
" Burton.
" Brown.
" Wallbridge.
" McKenzie.
" Ferrie.
Berth No. 60.
" 44.
" 61.
" 41.
" 49.
" 45.
" 82.
Township of Hagerman.
" Wilson.
" Chapman.
Muskoka river.
Township of Gibson.
Berth No. 123.
" 129.
" 130.
Township of Baldwin.
" Shakespeare.
" Hullam.
" May.
" Salter.
" Merritt.
" Tennyson.
" Spragge.
" Shedden.
Berth No. 106.
" 105.
" 101.
" 100.
" 192.
Township of Chaffey.
" Cardwell.
" Franklin.
" Brunel.
" Muskoka.
" Armour.
" Draper.
" Stephenson.
" Macaulay.
" McLean.
" Chaffey.
" Watt.
" Stisted.
" Oakley.
" Croft.
" Ryerson.
" Conger.
" Freeman.
" Christie.
" McKellar.
" Ferguson.
" McDougall.
" Foley.
" Shawenegan.
" Carling.
" Monteith.
" Foley.
" Dill.
Berth No. 68.
Township of Walters.
" Louise.
" Drury.
" McConkey.
" Hardy.
" Machar.
" Lount.
" Mowat.
" Blair.
" Pringle.
" Gurd.
" Franklin.
" Wood.
" Medora.
" Oakley.
" Machar.
" Foley.
" Field.
" Nipissing.
" Himsworth.
" Fairbank.
" Cascaden.
" Springer and Caldwell.

WESTERN AGENCY.—*Continued.*

Township of Perry.
" Plummer and Plummer Add.
" Rose.
" Kirkwood.
" Lefroy.
" Montgomery.
" McMurrich.
" Monck.
" Stisted.
" Patterson.
" Badgerow.
Berth No. 8.
" 16.
" 37.
Township of Morrison.
" Laurier.
" Mowat.
" Blair.
" McLean.
" Shawenegan.
" Ridout.
" Sherbourne.
" Hindon.
" Patton and Thompson.
" Thompson, Part of.
" Bright.
" Bright, additional.
" Day.
Blind river, Berth No. 2.
" " 1.
Township of Cobden.
" Striker.
" Rutherford.
Berth No. 3.
Township of Laurier.
" Springer.
" Gurd.
" Himsworth.
" Machar.
" Oakley.
Berth No. 163.
" 151.
" 11.
" 20.
Township of Raller.
" Mowat.
" Blair.
Berth No. 188.
Township of Himsworth.
" Patterson.
" Gurd.
" Nipissing.
" Humphrey.
" Medora.
Berth No. 26.
Township of McKim.
Berth No. 118.
Township of Macaulay.
" Watt.
" Chaffey.
" Stephenson.
" Brunel.
" Conger.
" Humphrey.
" Sinclair.
" Bethune.
" Proudfoot.
Berth No. 124.
Township of Machar.
Berth No. 90.
" 69.
Township of Digby.
" Laxton.
" Mills.
Berth No. 169.
Township of Greenock.
" McConkey.
" Mills.
Berth No. 98.
Township of Nairn.
" Trill.
" Ermatinger.
" Monteith.
" Christie.
" Spence.
" Ferguson.
" McKellar.
" Hagerman.
" Armour.
" Dalton.
" Digby.
" Carden.
" Rama.
" Anson.
Berth No. 112.
Township of Proudfoot.
" Patterson.
" Sinclair.
" Neelon.
Berth No. 16.
" 22.
Township of Patterson
" Gurd.
" Laurier.
" Nipissing.
" Himsworth.
" Rayside.
Berth No. 4.
Township of McMahon.
Berth No. 111.

WESTERN AGENCY.—*Continued.*

Township of Gough.
Berth No. 120.
" 156.
Township of Stisted.
" Hager.
" Aurey.
Berth No. 6.
" 15.
Township of Wells.
" Gould.
" Houghton.
" Kirkpatrick.
Berth No. 113.
Township of Galbraith.
" Joley.
" Sinclair.
" McMurrich.
" Hardy.
Berth No. 75.
" 83.
Township of Brunel.
" Morin.
" Macaulay.
" Gladstone.
Berth No. 35.
" 120.
" 32.
" 40.
" 46.
Township of Dryden.
" Creighton.
" Esten.
" Chaffey.
" Perry.
" Patterson.
Berth No. 157.
" 162.
" 167.
" 175.
Township of Parkinson.
Berth No. 131.
" 132.
" 138.
" 142.
" 143.
" 149.
" 161.
Township of Scarfe.
" Otter.
" Day.
Berth No. 25.
" 27.
Township of Burpee.
" Muskoka.
" McLean.
Township of Livingston.
Berth No. 144.
" 145.
" 176.
" 182.
Township of Snider.
" McClintock.
" Draper.
Berth No. 7.
" 15.
" 17.
" 18.
" 23.
" 26.
Township of Sinclair.
" Pringle.
" Strong.
" Victoria.
Berth No. 136.
" 137.
" 24.
Township of McMurrich.
" Lamont.
Berth No. 51.
" 43.
Township of Hawley.
Berth No. 30.
" 29.
Township of Pringle.
" Humphrey.
Peninsula north of Badgley Islands.
Township of Perry.
" Strong.
" McLean.
Berth No. 12.
" 20.
" 36.
Islands in Georgian Bay.
Berth No. 53.
Township of Broder.
Berth No. 10.
" 14.
" 28.
" 19.
Township of Dunnet.
" Coffin.
" Carlyle and Goschen.
" Goschen.
" Humbolt.
West side of Nipigon Bay, lake Superior.
St. Joseph's Island.
Township of Springer.
Berth No. 107.
" 119.
Tarentons.

WESTERN AGENCY.—*Continued.*

Korah.
Franklin.
Muskoka.
Big Win Island.
Township of Humphrey.
" Morrison.
Berth No. 168.
Round Island.
Township of Cardwell.
" Draper.
" Strong.
" Muskoka.
" Mills.
" Digby.
" Proudfoot.
" Rutherford.
Sandy Bay, lake Huron.
Township of Rutherford.
" Cardwell.
" McConkey.
" Rama.
" Tarentons.
" Pringle.
" Joley.
" Chaffey.
" McLean.
" Stephenson.
Berth No. 52.
Township of Stisted.
Phillip Edward, Island.
Berth No. 139.
Township of Blezzard.
" Garson.
Berth No. 48.
" 160.
Township of Patton.
" Burpee.
" Cardwell.
" Grassett.
Berth No. 59.
Township of Lorne.
" Morrison.
St. Joseph's Island.
Township of Morrison
" Watt.
" Foley.
" Brunel.
" Denison.
" Conger.
" Cowper.
" Mills.
" Prince.
" Rama.
" Rutherford.
" Coffin.
Township of McKinnon.
" Chaffey.
St. Joseph's Island.
Township of Morrison.
Berth No. 3.
Township of Lount.
" McLean.
" Gibson.
" Carden.
Hudson's Bay location.
Brunel.
St. Joseph's Island.
Nightingale.
Township of Biggar.
" Stisted.
" Chaffey.
" Ballantyne.
" Shawenegan.
" Bishop.
" Perry.
Sandy Island, lake Nipissing.
Township of Carrisby.
" Hunter.
" McLauchlin.
" Livingston.
" Pentland.
" Wilkes.
" Chisholm.
" Watt.
" Biggar.
" Wilkes.
" Shawenegan.
" McMurrich.
" Chaffey.
Berth No. 5.
" 8.
Township of Chaffey.
" Foley.
" Perry.
" Ballantyne.
" Livingston.
" McClintock.
" Butt.
" Devine.
" Hunter.
" Hindon.
" Ridout.
" Macaulay.
" Chaffey.
" Brunel.
" Hindon.
" Ballantyne.
" Livingston.
" Perry.
Rainy river.

WESTERN AGENCY.—*Continued.*

Township of Lawrence.
Thunder Bay.
Township of McMurrich.
" Draper.
" Lefroy.
" Butt.
Islands in Lake of the Woods.
Township of Hunter.
" McCraney.
" Finlayson.
" Biggar.
" Morgan.
Berth No. 5, Thunder Bay.
Township of Awres.
Berth No. 2, Rainy river.
" 32, "
" 8, Finlayson.
Township of Lumsden.
Berth No. 11, Rainy river.
" 69, "
" 3, township of Hunter.
" 4, " "
" 3, " McLaughlin.
" 1, " Peck.
" 2, " "
" 3, " "
" 6, " "
" 2, " McCraney.
" 4, " "
" 2, township of Paxton.
" 3, " "
Berth No. 1, township of Paxton.
" 4, " "
" 5, " "
" 6, " "
Part of township of McLennan.
West side of Lake Pogamasing.
Berth No. 1, Thunder Bay.
" 27, Rainy River.
" 65, "
" 67, "
" 68, "
" 64, "
" 5, township of Hunter.
" 66, Rainy River.
Township o Strong.
St. Joseph Island.
Township of McCraney.
" Peck.
" Finlayson.
" Peck.
" Finlayson.
" Butt.
Rainy River.
Township of Butt.
Rainy River.
Township of Finlayson.
" McCraney.
" Finlayson.
Berth No. 36, Rainy River.
" 37, "

BELLEVILLE AGENCY.

BERTHS AND LOCATIONS SUBJECT TO LICENSE.

Township of Harvey.
" Glamorgan.
" Monmouth.
" Snowden.
" Harvey.
" Glamorgan.
" Cavendish.
" Anstruther.
" Harvey.
" Sherbourne.
" Burleigh.
" Cavendish.
" Galway.
" Anstruther.
" Chandos.
" Cardiff.
" Monmouth.
" Minden.
" Stanhope.
Township of Lutterworth.
" Stanhope.
" Anson.
" Mayo.
" Marmora.
" Harvey.
" Lake.
" Cardiff.
" Galway.
" Limerick.
" Cashel.
" Grimsthorpe.
" Barrie.
" Hinchinbrooke.
" Anstruther.
" Burleigh.
" Snowden.
" Sheffield.
" Stanhope.

BELLEVILLE AGENCY.—*Continued.*

Township of Glamorgan.
" Harvey.
" Cavendish.
" Sheffield.
" Kaladar.
" Elzevir.
" Anglesea.
" Grimsthorpe.
" Portland.
" Barrie.
" Harvey.
" Galway.
" Minden.
" Seymour.
" Kennebec.
" Snowden.
" Galway.
" Lutterworth.
" Belmont and Marmora.
" Belmont.
" Harvey.
" Brighton.
" Anglesea.
" Sheffield.
" Belmont.
" Cashel.
" Chandos.
" Lutterworth.
" Somerville.
" Monmouth.
" Loughboro'.
" Bedford.
" Belmont.
" Fenelon.
" Dummer.
" Somerville.
" Sherbourne.
" Glamorgan.
" Somerville.
" Lutterworth.
" Belmont.
" Marmora.
" Somerville.
" Harvey.
" Methuen.
" Glamorgan.
" Lutterworth.
" Snowden.
" Harvey.
" Somerville.
" Sherbourne.
" Dummer.
" Smith.
" Duro.
" Harvey.

Township of Wollaston.
" Methuen.
" Effingham.
" Abinger.
" Anglesea.
" Tudor.
" Chandos.
" Lutterworth.
" Bedford.
" Brighton.
" Sherbourne.
" Anstruther.
" Burleigh.
" Marmora.
" Tudor.
" Faraday.
" Herschel.
" Hinchinbrooke.
" Kaladar.
" Hungerford.
" Dungannon.
" Limerick.
" Anglesea.
" Kennebec.
" Sheffield.
" Elzevir.
" Grimsthorpe.
" Cashel.
" Cardiff.
" Methuen.
" Lake.
" Belmont.
" Burleigh.
" Dummer.
" Harvey.
" Dummer.
" Kaladar.
" Harvey.
" Tudor.
" Hungerford.
" Abinger.
" Elzevir.
" Somerville.
" Sherbourne.
" Elzevir.
" Smith.
" Sherbourne.
" Lutterworth
" Methuen.
" Wollaston.
" Laxton.
" Sherbourne.
" Lake.
" Bedford.

OTTAWA AGENCY.

Berths and Localities Subject to License.

Township of Lynedoch.
" Hagarty.
" Bangor.
" Jones.
" Radcliffe.
" Brudenell.
" Bowes.
" Oso.
" Olden.
" Sherbrooke, N.
" McNab.
" Sherbrooke, S.
" Blythefield.
" Bagot.
" Darling.
" Lavant.
" Ashley.
" Denbigh.
" Abinger.
River Ottawa, lake Temiscamingue.
Township of Barrie.
" Clarendon.
" Miller.
" Canonto, S.
Ottawa River (Pettewawa).
Township of Chisholm.
" Nipissing.
" Himsworth.
" Westmeath.
" Sebastopol.
" Olden.
" Allice.
" Bogot.
" Algoma, north.
" Wilberforce.
" Darling.
Pettewawa river.
Township of Wilberforce.
Indian river.
Township of Devine.
" Biggar.
" Bishop.
" Osler.
" Bagot.
" Darling.
" Calvin and Papineau.
" Mattawa.
" Papineau.
" Phelps.
" Olrig.
" Mattawan.
" Hagarty.
" Algoma, north and south.
Township of Brudenell.
" Mayo.
Ottawa river.
Township of Limerick.
Pettewawa river.
" " Nipissing branch.
Madawaska " Opeongo branch.
Pettewawa " "Lac La Ville" branch.
Ottawa river (deep river).
Township of Admaston.
" Grattan.
" Phelps.
" Olrig.
" Bonfield.
" Ferris.
" Nipissing.
" Himsworth.
" Papineau.
" Effingham.
" Palmerston.
" Cardiff.
" Bangor.
" Wicklow.
" Mayo.
" Carlow.
Chalk river.
Ottawa river.
Township of Roxborough.
" Limerick.
Egan's creek (Madawaska).
Madawaska river.
Ottawa river.
Pettewawa river, Amable du Fond.
Township of Darling.
" Grattan.
" Sebastapol.
" Bagot.
" Admaston.
" Pakenham.
" Blythefield.
" Effingham.
" Palmerston.
" Raglan.
" Carlow.
" Madawaska.
" Denbigh.
" Farraday.
" Herschel.
" Sherwood.
Montreal river.
Township of Abinger.
" McClure.
" Monteagle.

OTTAWA AGENCY.—*Continued.*

Township of Sabine.
Ottawa river.
Bonnechere river.
Madawaska river.
Township of Mayo.
" Raglan.
" Dungannon.
" South, Algoma, Sebastopol and Grattan.
" Blythefield.
" Dungannon.
" Monteagle.
Madawaska river, Mississippi branch.
Pettewawa river.
Township of Grattan.
Indian river.
Township of Ferris.
" part of Ferris and Bonfield.
" part of Bonfield.
" Calvin.
" part of Widdifield and Ferris.
Amable du Fond.
Madawaska river, Opeongo branch.
" " Constance creek.
" "
Township of part of Westmeath.
" McKay.
" Darling.
Madawaska river (Clear lake).
Township of Olden.
" Oso.
" Darling.
" Alice.
" Monteagle.
" Pettewawa.
" Pakenham.
" Denbigh.
" Raglan.
" Canonto, south.
" Denbigh.
" Bagot.
" Olden.
" Admaston.
" Westmeath.
" Lavant.
" Ross.
" Bonnechere.
" Wilberforce.
" Algoma, north.
" Sherwood.
Little Madawaska.
Township of Bangor.
Ottawa River.
Bonnechere.
Madawaska river, Tork branch.
Madawaska river.
Pettewawa river.
Township of Miller.
" Griffith.
" Canonto, north.
" Griffith.
" Madawaska.
" Jones.
" Burns.
" part of Sabine and Lyell.
Madawaska river.
Township of part of Sherwood and Burgess.
Pettewawa river.
Deep river.
Lake Temiscamingue and Ottawa river.
Lake Temiscamingue.
Ottawa and Amable du Fond rivers.
Pettewawa river, Amable du Fond brch
" "
Madawaska river.
Township of Miller.
" Raglan.
Madawaska and Mississippi rivers.
Township of part of Raglan.
Mississippi and Madawaska rivers.
Township of Canonto, south
Bonnechere river.
Ottawa river.
Lake Temiscamingue.
Bonnechere.
Madawaska.
Lake Temiscamingue and Ottawa river.
Pettewawa river.
" " south branch.
Mattawan river.
Deep river.
Chalk river.
Ottawa river.
Indian river.
Lake Temiscamingue and Montreal river.
Deep, Ottawa and Chalk rivers.
Chalk river.
Pettewawa river, south branch.
" " north "
Mattawan river.
Ottawa river.
Indian river.
Montreal river.
Township of Oso.
" Darling.
" Admaston.
" Bagot.
Pettewawa river.
Township of Lynedoch.
" Ashley.

OTTAWA AGENCY.—*Continued.*

Township of Griffith.
Ottawa river and Pettewawa.
Township of Buchanan.
Pettewawa river.
Amable du Fond river.
Township of Stafford.
" Wilberforce.
Indian river.
Ottawa river.
Amable du Fond river.
Mattawan river.
Ottawa and Mattawan rivers.
Bassett's creek.

REPORT

OF THE

COMMISSION

ON

MUNICIPAL TAXATION.

1893.

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY.

TORONTO
PRINTED BY WARWICK & SONS, 68 AND 70 FRONT STREET WEST.
1893.

REPORT

OF THE

COMMISSION ON MUNICIPAL TAXATION.

TORONTO, April 24th, 1893.

To the Honourable

GEORGE AIREY KIRKPATRICK,

Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

We, the undersigned Commissioners, appointed to collect information with regard to the subject of direct taxation for municipal and other purposes, beg to submit the following report.

We have the honour to be

Your Honour's most obedient servants,

J. R. CARTWRIGHT,
T. W. ANGLIN,
E. SAUNDERS.
} Commissioners.

REPORT.

Your Commissioners have been directed to collect all such facts obtainable without an oral examination of witnesses, as bear on the several questions, which have arisen with regard to direct taxation for municipal and other purposes, and its incidence, and of present and proposed exemptions from taxation, including in regard to all such particulars a comparison of the laws and practice of this province with the laws and practice of Great Britain, the other provinces of the Empire, the United States and elsewhere.

The Assessment Act in this province provides as a fundamental basis of municipal taxation that all municipal, local or direct taxes or rates shall, where no other express provision has been made in this respect, be levied equally upon the whole ratable property, real and personal, of the municipality or other locality, according to the assessed value of such property, and not upon any one or more kinds of property in particular or in different proportions. (55 V., c. 48, s. 6.) It is, by the same Act, provided that, except in the case of mineral lands, real and personal property shall be estimated at their actual cash value, as they would be appraised in payment of a just debt from a solvent debtor. 55 V., c. 48, s. 26, (1).

"Real Property," includes all buildings or other things erected upon or affixed to the land, and all machinery or other things so fixed to any building as to form in law part of the realty, and all trees or underwood growing upon the land, and land covered with water, and all mines, minerals, quarries and fossils in and under the same, except mines belonging to Her Majesty.

"Personal Property," includes all goods, chattels, interest on mortgages, dividends from bank stock, dividends on shares or stocks of other incorporated companies, money, notes, accounts and debts at their actual value, income and all other property, except real property as above defined, and except property expressly exempted.

The principle that *real and personal* property are equally liable to asssessment for municipal purposes, which is formally expressed in the foregoing provisions, has given rise to much of the agitation on this subject, and it is therefore interesting to ascertain how far and with what results the same principle has been applied elsewhere.

In Great Britain to which our attention is naturally first directed, we find that personal property is not taxed at all, and the greater part of the municipal revenue is raised from real estate. There are, however, certain local expenditures to which the Imperial Government formerly contributed by direct grant from the Imperial Exchequer in aid of the local rates, under the following heads: pauper lunatics, poor law and sanitary officers, registrars of births and deaths, criminal prosecution, highways, Metropolitan fire brigade, Metropolitan police, county and borough police, grant in lieu of rates on Government property, prisons, reformatories and industrial schools and school boards. Within the past few years these direct grants have been withdrawn, and in lieu of them the Imperial Government has transferred to the local authorities certain duties and portions of duties which are hereafter more particularly referred to in dealing with the English municipal system.

A recognized English writer in a work entitled, "Local Government and Taxation in the United Kingdom," [p. 503], says: "It should not be forgotten that although at present the main weight of local taxation is upon land, real property enjoys exemptions under our system of Imperial Taxation, which to quote Mr. Gladstone: 'It would not be possible to maintain for a single moment after you remove the exemption of personal property from local taxation.'" Mr. Gladstone further added: "I do not give an opinion beyond saying, that if a general proposition is to be laid down, that personal and real property are to share in equal proportions the burdens of local taxation, it is impossible to resist the co-relative proposition that real and personal property must be equally charged with respect to Imperial Taxation."

Turning from Great Britain to the United States, we find that the system there adopted corresponds substantially in principle with the municipal system of taxation in Ontario.

In a report of the Maryland Tax Commission issued in 1888, it is stated that "In every state of the union, direct taxes are imposed upon all classes of property, real and personal, either for state or local purposes, and the State of Pennsylvania which has frequently been pointed to as an illustration of the practicability of releasing personal property from taxation, because she subjected real estate to the greater part of the public burdens by making it the object of *local* taxation, and reserved personalty, so far as it was taxed at all, for state revenues, has lately put in operation more vigorous measures for the enforcement of taxes on personal property, alleging as a reason therefor, the injustice and injury suffered by the holders of real estate and the farming population, and personal property is now taxed in that State for both state and county purposes, except that all mortgages and other evidences of debt, articles of agreement or accounts bearing interest and all public loans are exempt from local taxation." The State now collects taxes on almost every kind of personal property, including mortgages, bonds, judgments, promissory notes (except those held by banks in the usual course of business), and moneys at interest, and pays over to the municipalities three-fourths of the moneys thus collected. Philadelphia received from this source in 1892, about $800,000.

It ought perhaps to be here stated that it is well nigh impossible to obtain all the details of civic government in the United States. A recent American writer on this subject says: "When we reflect that there are 443 American cities with a population of many millions of inhabitants, and that these cities are controlled by over two score of independent Commonwealths, the impossibility of accurately describing the municipal tax system (of the United States) becomes apparent." To avoid useless repetition and an unnecessary expenditure of time, your Commissioners have selected seven important states of the union and a somewhat larger number of cities (Canadian and American) as representative of the rest, and in making this selection we have not been unmindful of the fact that the states which are situated nearest to us would be more likely to afford the best opportunity for comparison.

In the United States as elsewhere, the principal municipal tax is levied on real estate, but in some cities the taxation of personal property has been carried to a most remarkable length: for instance in the city of Philadelphia there was, until recently, a specific tax (in this instance for state purposes) on watches. Every wearer of a gold watch was liable to a tax of $1. The owner of a silver watch escaped with 75 cents, and the proprietors of watches of any other character were directed to pay 50 cents each. As might be expected this tax produced a very small sum.

One of the results of our investigation is to show that the people of the United States are for the most part wedded to the system of raising local taxation from every kind of property, real and personal, and this general property tax is described by the writer already quoted as the "Keystone of the Financial Arch." It is asserted on the authority of statistics, given by the census returns of the United States, that two-thirds of the total receipts of all the cities of the union are derived from the taxation of both real and personal property, the remaining one-third being obtained from licenses and other special sources. It is quite true that this system of taxing real and personal property on the same basis does not give universal satisfaction, but no perceptible impression has as yet been made upon it, although there appears to be a disposition in some quarters to throw an increasing proportion of local taxation on real estate. The history of the agitation is very much the same everywhere. The holders of real estate strongly oppose this tendency to increase the burdens upon land, and those whom it would doubtless benefit, just as strongly favor it. A synopsis of the arguments by which this proposition is opposed and defended, will be found elsewhere in this report.

Taking the facts as we find them, it appears clear that the principle underlying municipal taxation is the same in Ontario as in the United States; some of the details vary, but the two great divisions of real and personal property are generally recognized as equally suitable for municipal taxation in both countries. The first material difference, which presents itself is the "poll tax." This tax, which varies in amount from $1 to $4, and which with certain exceptions is levied on all male persons within the State, is imposed in a majority of the states of the union, including Alabama, Arkansas, California, Connecticut, Florida, Georgia, Louisiana, Maine, Massachusetts, Mississippi, Nevada, New Hampshire, Rhode Island, North Carolina, South Carolina, Tennessee, Texas, Virginia, West Virginia and Vermont, and in several of the states its imposition is expressly directed by the constitution.

It may not be out of place to show how the poll tax is regarded in different states of the union, and for this purpose two or three instances will suffice. Alabama by its constitution authorizes the General Assembly to levy a poll tax not to exceed $1.50, but the proceeds are to be applied "exclusively in aid of the Public School Fund." In the constitution of Georgia a similar provision is found; the tax however, is not to exceed $1 on each poll. Attention is called to the fact that in the two States just mentioned, the imposition of the tax is *permissive*, but by the constitution of Louisiana it is *imperative*. It is not to exceed $1.50 on all male inhabitants, and is to be used exclusively for "school and charitable purposes." On the other hand we find in the constitution of the State of Maryland, this declaration: "That the levying of taxes by the *poll* is grievous and oppressive and ought to be prohibited, (and) every person in the State or persons holding property therein, ought to contribute his proportion of public taxes for the support of the Government, according to his actual worth in *real or personal property*." And again, the constitution of Arkansas, while asserting that a poll tax is both "grievous and oppressive," nevertheless authorizes its imposition, but only for school purposes.

On this subject, Dr. Ely, says: "Poll taxes exist in most of the southern and New England States, and in some of the other states. Poll taxes are unworthy of a civilized nation in the nineteenth century. They are to be rejected also from purely economic grounds. In order not to be impossible of collection without great hardship, they must be so low as to yield little to the public treasury. Poll taxes are both state and local. In some states, only state poll taxes are known, but in others, both state and local poll taxes exist."

Your Commissioners need scarcely observe that no tax on the "poll," exists in Ontario, although certain persons whose taxes do not amount to $2, may, instead of statute labour be required to pay $1 yearly, under the provisions of Sec. 88 of the Consolidated Assessment Act of 1892. Those liable to this tax are comparatively few in number, and it could hardly be contended that the dollar thus collected is either "grievous or oppressive." The tax, however, in Ontario yields a very small sum, and its abolition would cause no serious loss to the municipalities. Prior to July 1st, 1891, the statute labour tax in Ontario was $2. The following table will show the effect of the reduction in the various cities in the Province:

STATUTE LABOUR TAX.

Name of City.	Amounts collected.	
	1891.	1892.
Toronto	$2,514 00	*See note.*
Hamilton	1,186 00	$645 00
London	1,010 00	606 00
Kingston	540 00	300 00
Brantford	427 00	272 00
Guelph	226 00	102 00
St. Thomas	130 00	*120 00
Stratford	80 00	60 00
Ottawa		
Belleville		
Windsor		

*NOTE.—In the case of Toronto the collectors not having returned the rolls for last year no return can be given, but it is expected that the proceeds of this tax for 1892 will not exceed $1,500. In St. Thomas those liable to pay the tax had the benefit of the reduction in 1891 as well as in 1892. In Ottawa, Belleville and Windsor the provisions of the law in this behalf have not been enforced.

The next point of difference between the U.S. system and that adopted in Ontario, which appears to call for comment, is that, most of the states of the union, in dealing with banks and incorporated companies, such as railroad, express, telegraph, telephone and other similar corporations, either tax the capital stock direct, or impose an adequate tax on what they term the "corporate franchise." In the case of banks, the capital stock is taxed direct (instead of the interest or dividends as in Ontario), and the usual rate imposed upon individuals in the ordinary way applies to bank stock. In the case of savings' banks, a smaller rate is generally imposed, which, in the State of Massachusetts, is fixed at one-half of one per cent. on the amount of the deposits. In the same state they impose on "co-operative saving fund and loan associations" one quarter of one per cent. per annum on the amount of the monthly dues paid in by the shareholders, and they require insurance companies to pay what is called an "excise tax," at the rate of one quarter of one per cent. per annum upon a valuation equal to the aggregate amount of all the policies in force on the 31st day of December in any year.

In the case of certain insurance companies, a tax of one per cent. on all premiums received during the year is exacted, and other corporations are required to pay a tax upon their "corporate franchises" at a valuation equal to the aggregate value of the shares in their capital stock, which is really but another mode of taxing the capital stock itself. It would occupy altogether too much

space to quote all the provisions of the law in this behalf even in one state, but enough has been said to indicate some important points of difference in a general way between the system adopted in Ontario and that in force in one of the most important states of the union in dealing with corporate franchises, stock and property. Other examples will appear hereafter.

To prevent confusion it is necessary at this point to call attention to the fact that while in Ontario all taxes collected by the municipal authorities—liquor licenses not being included—are used for local purposes, the taxation imposed by virtue of the assessment laws of the various States of the Union, cannot properly be described as municipal taxation, in the sense in which that term is used in Ontario, for the reason that the revenue thus obtained through the municipalities in the several States, is, as a rule, only partially devoted to municipal purposes, a considerable percentage being required by law to be paid over to the State. In some instances a State officer collects the State tax directly from the local taxpayer, and this system is also adopted in the Province of Quebec, as is hereafter shewn in the review of the laws of that province relating to the subject. In Pennsylvania, as already stated, the tax on personal property is collected by the State, and a portion of it is paid over to the municipalities. This State also imposes a direct tax for State purposes on incorporated companies and other associations.

There is, as already pointed out, also a difference in practice in collecting the tax on corporate stock or dividends. In Ontario we look to the shareholders, as a rule; but in the states the head office is generally required to pay the tax, leaving it to the company to collect from the shareholders. In fact this practice is nearly universal.

Your Commissioners understand that some of the Ontario corporations, having their head office in Toronto, pay the tax in one sum on the profits earned during the year, to the city treasurer, and deduct the amount so paid from the sum available for distribution among the shareholders.

Another difference in practice has reference to the mode in which the assessors of the respective countries proceed in obtaining the information necessary to enable them to make proper assessments. Section 14, of the Assessment Act of Ontario, prescribes the duties of the assessor in this province, whereby he is directed to make "diligent inquiry" for the information he is entitled to get, and under section 42 of the same Act, it is the duty of the person assessable "to give all necessary information to the assessors," and, if required, he is to deliver to the assessor a "statement in writing," giving the necessary particulars, and if he fails to deliver this written statement, or knowingly states anything falsely therein, he is on conviction thereof before a justice of the peace, liable to a fine of from $20 to $100 under the provisions of section 45.

But in most of the states of the union, the party assessable is compelled, in the first instance, to deliver to the assessor or other officer a written statement under oath, in which he swears that he has made a full disclosure; and for false statements he is not only liable to very heavy penalties, sometimes as high as $1,000, but is, in addition, liable to a prosecution for perjury. Notwithstanding the pains and penalties provided by the Assessment Acts of the various states, which are all more or less severe, it is positively asserted that what is called "intangible" property, escapes taxation to a very large degree.

The situation then is briefly this: In Ontario no oath is required from the person assessable; and the penalties for even making a false statement in writing are moderate, while in the United States oaths are everywhere required, and the penalties do not err on the side of leniency; but whichever system is adopted it would seem to be largely upon the moral sense of the people that we must rely

for a fair return. The absence of a proper degree of this moral sense has been often the subject of comment, and upon it is largely founded a demand for some other system of taxation based upon real estate which cannot be hidden away. As to whether this is a sufficient foundation for the demand is a question not within the province of your Commissioners to determine.

The income tax has not been generally adopted in the United States. In the four or five states in which it is levied, it produces relatively an inconsiderable amount, owing, it is said, in the first place, to the lax administration of the law, and also to the circumstance that the exemptions from this tax are liberal, reaching, in the case of Massachusetts, the sum of $2,000.

Another feature in the consideration of the general question of taxation, is, the basis of value adopted in the assessment of property liable to taxation.

It can, of course, make no difference whether the basis is the full value, or 25% or 50% of the value, so long as it is uniformly applied, but where the rule of assessing at full value is not strictly adhered to, small properties are liable to suffer as compared with larger ones. The law requiring all property to be assessed at its "actual cash value" as in Ontario, is almost universal, but it is very doubtful if it is properly observed anywhere, and in some places the law is systematically violated. Take the case of Chicago as an example. In a letter addressed to your Commissioners on this point, the comptroller of that city says: "The law requires the assessment to be made at the actual cash value, but the assessors entirely ignore it, and assess all property from one-sixth to one-tenth of its actual value." The treasurer of Montreal, where the law is the same in this respect as in Ontario, reports that for the purposes of assessments, property (*i.e.* real estate) in that city is estimated at about 75% of its value.

The cities of Montreal, Quebec and Winnipeg levy a business tax in lieu of a tax on personal property, to which further reference is made hereafter.

In one or two States of the Union a distinction is made between personalty and realty, in respect of the periods intervening between the successive assessments required by law. In Vermont, for example, "personalty" is assessed annually, while "realty" is assessed only "quadrennially."

It is the almost invariable rule throughout the United States to assess real estate to the owner of the fee, no enquiry being made as to whether or not the land is under mortgage, unless the mortgagee is in possession, in which case he is regarded as the owner for the purpose of assessment. In Michigan, however, in assessing mortgaged lands, the mortgagor and mortgagee are jointly assessed therefor in proportion to their respective interests in said lands. The provisions of the law in that behalf are hereafter fully set out in the review of the assessment law of that State.

We have already cited the section of the Assessment Act in this Province regulating municipal taxation, and we now proceed to a review of the laws of other countries on this subject.

ENGLAND.

The taxation of what is usually called personal property, for any purpose, fell into disuse in England many years ago. An Act passed in 1692 imposed a tax of four shillings in the pound on all property, real and personal for state purposes, but this, in so far as it was an attempt to revive a mode of raising revenue that had fallen into disuse, failed completely. Dowell, an English writer of repute, and the solicitor of inland revenue, says: "Personal property, slipped out of the assessment." In subsequent Acts only what became known as "The Annual Land Tax," was imposed.

The justices in General Quarter Sessions were, at a comparatively early day, empowered to assess, levy and collect "ratably and according to a certain pound rate" on the messuages, lands, tenements and hereditaments, within the county which they were supposed to represent, or any part of it, such sums as were necessary for the services entrusted to their charge.

Boroughs appear to have had no authority to levy rates on any kind of property until the great Municipal Reform Act of 1835 was passed. This authorised every borough council to assess, levy and collect, within their proper limits, such amount annually as might be required, should the borough fund prove insufficient to meet the demands made upon it. For this purpose, such powers were given to the borough councils, by this Act, as were given to the Quarter Sessions by the Act, 55 George III, cap. 51. The fees, dues and tolls levied by the borough authorities, which, with the rent of property belonging to the borough, fines and some smaller incomings, made up the borough fund, were not regarded as taxes.

The work of cleansing, lighting, watching, paving, putting down and maintaining sewers, and all improvements of this kind, were not regarded as part of the duties of the borough councils, and in most cases were entrusted under special Acts of Parliament to trustees who were empowered to levy rates to pay the cost of such works. These rates were levied on real property exclusively. The Act of 1835 authorised the trustees to transfer and the borough councils to assume, when transferred, all the powers and duties created by those special Acts; but such transfers were not made in all cases. Under the Health Act of 1848, borough councils were frequently appointed urban sanitary authorities, and thus clothed, when acting in that capacity, with extensive powers of making improvements and levying rates. The Public Health Acts of 1872 and 1875 imperatively constitute these bodies the sanitary authorities in such boroughs as do not form part of a larger district under an Improvement Commission or local board. Under another Act, several towns, some of which have a population of over 30,000, are managed by boards of Improvement Commissioners, who have powers similar to those of the urban sanitary authorities.

The city of London levies dues or duties on all the wine and coal landed at that port. These dues amount to between £400,000 and £500,000 a year.

The Act of 1888, by which nearly all the powers previously exercised by the justices in Quarter Sessions, were transferred to elective county councils, did not make any change in the mode or incidence of taxation.

Local taxation has increased enormously of late years, chiefly in the cities and towns. In 1887-8 it amounted:

In England to	£27,804,248
In Ireland to	3,050,385
In Scotland to	3,468,149

Several of the cities and towns of England now own and manage their water-works and gas-works, and derive revenues from their tramways (street railways). The gross municipal income from all industrial sources is said to be about nine million pounds. The interest on the money invested in these works by the boroughs is about three millions, and the cost of operating about five millions. The net profit is therefore about a million.

When the corn laws were repealed, the burdens on the local taxes, especially those felt to be most oppressive in the rural districts, were reduced by contributions from the imperial exchequer. Under the constant pressure of the agricultural interest in Parliament, these contributions were frequently increased. An Act of Parliament introduced by Mr. Goschen, Chancellor of the Exchequer, in 1888, and another passed in 1890, transferred to the local authorities the

proceeds of certain duties and parts of duties, collected by the imperial authorities' in lieu of the annual grants from the treasury. By these measures the relief to local taxation, which, in 1858, amounted to a million and a half pounds, and afterwards to nearly three millions, was increased to about six millions. Sir T. H. Farrer, in an article published in the *Contemporary Review*, November, 1890, estimates the revenue from those sources and the increase in the contribution thus:

Licenses	£3,000,000
Half probate duty	2,000,000
New duties on alcoholic liquors	1,000,000
	£6,000,000
Exchequer grants withdrawn	£2,850,000
Increase	£3,150,000

All licenses are issued by the Commissioners of inland revenue, who, at the same time, collect the duties which they pay to the credit of the local authorities. The probate duty is also collected by the imperial authorities, and the additional duties of six pence per gallon on spirituous liquors, and three pence per barrel on beer, are paid with the other duties of customs or excise, and then passed to the credit of the local taxation fund. The complete control of the prisons and gaols, and the partial control of the police, of pauper lunatics and of other services, which the Government assumed when aid was given directly from the treasury is still retained, and all expenditures from this fund for such services are made under orders from one or more of the Government boards, or with their express approval.

For some years Parliament has annually voted a considerable sum to be paid to the local authorities in lieu of rates on such Government property as it was alleged, should not be wholly exempt from local taxation. In Ireland, the amount so voted is described as bounty, in lieu of rates on Government property. The amount voted for England and Wales in 1880 was £161,768. The amount voted for Ireland was £46,825.

The sources of all municipal revenue in England are the rates which are levied on real estate exclusively, the rents derived from properties owned by the boroughs and other municipalities, the tolls, dues and market fees collected in boroughs, the fines imposed, and the proceeds of the duties collected by the imperial authorities, which, under the Acts of 1888 and 1890, are "paid to the local taxation account."

In the London *Economist* of June 20th, 1890, appeared a statement taken from the 19th report of the Local Government Board, which shows what the estimated ratable value of the real property in the metropolis, in the boroughs, outside the metropolis, and in the counties of England and Wales, was, in the years 1887-8, what was the aggregate of the rates levied on all such properties and what the proportion of the taxation borne by them respectively:

Ratable real property in metropolis	£31,000,000
" " " " boroughs	27,000,000
" " " " counties	72,000,000
	£130,000,000

The total amount of the rates imposed on these several descriptions of real property in that year was £27,194,836, levied as shewn in the following statement which

also gives the amounts levied on the same classes of property in the year 1873-4, in order to show how great the increase had been, especially in the urban districts:

	Amounts levied in 1873-4	in 1887-8
By extra metropolitan authorities	£4,616,763	£ 8,049,808
By metropolitan authorities	3,907,913	6,970,732
By urban and rural authorities	8,663,310	10,295,427
By rural authorities	1,716,851	1,878,869
	£18,904,837	£27,194,836

The amount levied on districts, exclusively rural, was comparatively small and the increase in those districts was trifling.

SCOTLAND AND IRELAND.

The mode in which the amounts required for local purposes are assessed, levied and collected, and indeed the manner in which the amounts required for the different local services are determined, differ in England, Scotland and Ireland. But in all three, cities and towns own properties, from which they receive rents; and they collect dues, fees and tolls, which, in the aggregate, amount to a considerable sum. In all the three kingdoms alike, whatever else is required for local purposes—and this is much the larger portion of the total expenditure—is raised by a rate on real property.

In one of the tables prepared by Mr. Goschen, in 1870, the amounts raised in each of these countries in the years 1868-9 by rates on real property, and otherwise is thus stated:

	England.	Scotland.	Ireland.
Taxes on real property—			
Rates	£16,223,000	£1,500,000	£2,284,000
Taxes not on real property—			
Tolls, dues, etc.	4,363,000	500,000	283,000
	£20,586,000	£2,000,000	£2,567,000
Miscellaneous receipts—			
Ordinary receipts from property	£ 336,000	£ 450,000	£ 69,000
Extraordinary do	999,000		
Other miscellaneous do	1,539,000	100,000	104,000
Government grants	1,225,000	200,000	78,000
	£24,685,000	£2,750,000	£2,818,000

Of the whole amount raised by local taxation of all sorts, 78.81 per cent. was raised from real estate in England, 75 per cent. in Scotland, and 88.88 per cent. in Ireland. The taxes on real property, imposed in all ways for imperial purposes, were, in England, £7,050,337; in Scotland, £1,500,000, and in Ireland, £2,284,000.

In Scotland, the landowners pay one-half the rates and the occupants the other half. In Ireland the landowners allow as part payment of rent one-half of the poor rates, which are paid in full by the occupiers in the first instance, and since the change in the land laws, the landowners pay one-half the county rates, or cess, also.

FRANCE.

In all the countries of continental Europe the system of raising a municipal revenue differs essentially from that which has for many years obtained in England, Scotland and Ireland. In many of the cities of France a large proportion of the municipal revenue is raised by what are called the *Octroi* duties which are imposts on food, beverages, fuel and other articles, levied at the various entrances to the cities. In some other parts of Europe similar imposts are levied. They are supposed to be a survival of the Roman Portaria, and they certainly have been levied since the 13th century. Similar duties were probably levied in all the cities of Europe when those cities, to a large extent, were distinct and almost independent communities. The cities have several other sources of revenue, but the income from all these is not sufficient and the state which, for its own purposes, taxes land and houses imposes an additional tax (*centimes additionels*) sufficient to raise for the cities, departments and communes such amount as may be found to be necessary. It is not, however, left to the municipalities to determine how much shall be raised in this way. Mr. Wells, in his report on local taxation in the State of New York, says—and there is no reason to suppose that the law has been changed in this respect:—

The Revised Statutes of France provide that the *Corps Legislatif* shall annually establish the maximum rate of taxation above which no real estate shall be taxed. Then the *Corps Legislatif* annually apportions the amount to be raised by the several departments, and limits the rate of taxation which the *conseils generaux* (boards of supervisors) may levy in apportioning the rate for the expenses of the *cantons* (counties), and also for the municipalities. The *Corps Legislatif* also, in annually levying the direct taxes, gives authority for the levy of a special tax at a small rate, the proceeds of which are to be used exclusively in paying pressing claims on the departments, cantons or municipalities in case other resources are not sufficient to meet and discharge such liabilities. A permanent law defines what shall be considered as pressing liabilities, viz.: the maintenance of the buildings of the prefecture, the salaries of the judiciary, the interest of debts lawfully contracted and the judgments of the courts.

The mode in which the municipal revenues are made up can best be learned perhaps from the following statement (in pounds sterling) of the various amounts received by the municipal authorities of Paris in the year 1883, and the sources from which they were derived. It will be observed that the revenue from the centimes additionels was not quite one-tenth of the whole, and that, as under the modern English system, the general Government contributed to the cost of the police and some other expenditures. It should be stated also that an old law, which required the inhabitants to clean the streets in front of their houses every morning, is still in force, and that the amount credited to street cleaning is paid as commutation for this service and not as what is properly a rate.

Paris Revenue.

Octroi (municipal customs)	£5,996,802
Communal centimes (centimes additionels)	948,805
Municipal share in the profits of the Gas Co	604,000
Water rates and income from canals belonging to the city	442,867
Government subsidy to the municipal police	307,753

Fines and shooting licenses	£220,110
Revenue for public instruction (legacies etc.,) unknown.	
Duty on gas supplied to private persons—about 5½d. per 1,000 cubic feet	225,250
Cab-stands, omnibuses and tramways	194,937
Government subsidy for the maintenance of the public roads and streets	164,000
Dues from goods exposed for sale in the public markets.	180,112
Slaughter-houses	138,136
Householders' street cleaning tax (tax de balayage)	108,416
Warehouses	101,492
Sale of burial lots in the cemeteries	94,284
Stands in the market and market places	83,461
Paving and cleaning of the streets	95,717
Ground rents	62,594
Night soil and sewage	56,597
Rent of stands on the public streets	51,782

Including less important items, the total ordinary revenue in 1882 was £10,489,373.

The items in the extraordinary budget chargeable on general and special funds amounted to £6,450,037 but a large proportion of this consists of sums which are carried forward from one fiscal year to another till the expenses which they are meant to cover are liquidated.

The chief items in the *Octroi* revenues of Paris were:

Beverages	£2,566,118
Eatables	1,232,362
Liquids other than beverages	608,238
Fuel	463,278
Building materials	525,698
Wood for industrial purposes	246,693
Fodder	204,102
	£5,986,541

The total amount collected in all the cities of France in which *Octroi* duties are levied was, in the year 1889, about twelve million pounds sterling. The amounts stated in francs were:

Drinks and liquids	francs 139,291,342
Food	85,090,337
Fuel	32,565,756
Fodder	16,218,211
Material (building)	25,976,552
Miscellaneous	452,778
	francs 299,663,976

In 1790, the "Impot Foncier" was apportioned on property (real) according to its net revenue as a substitute for the many oppressive and often unproductive taxes, which had been imposed under the monarchical regime. It was "not to exceed one-sixth of the general revenue in amount," and one-fourth as much was to be levied for local purposes as for those of the general Government. The *cadastre* or survey and valuation of the lands, according to which this impost was apportioned, remained unchanged for a long time. As regards the value of lands the cadastre is still the same, but, in 1850, the increased value of houses was taken into account. Afterwards lands on which houses are built were separated

from what may be called farm lands, for the purpose of taxation, and the tax on lands was reduced. The tax on land "remains one of apportionment." The tax on houses, or rather on houses and the land they occupy, was thenceforward rated and the rate was fixed at 3.20 per cent. The amount raised for departments and communes, by the centimes additionels, has trebled since 1829. This tax for 1880 is stated to have been:

For general purposes..... francs	173,817,511
For the departments	94,077,070
For the communes.....	81,904,095
For relief and other purposes.....	5,350,874
francs	355,159,550

In 1890 the land tax amounted to 255 million francs—about £10,400,000.

The Mobilier, now a house tax, is apportioned and yields about three million pounds. The additional centimes yield as much more, for local purposes, and the door and window tax added to these make the total tax on houses now, from 13 to 14 million pounds. Another statement says: "In France (under the patente) graded taxes are imposed on salaries and on the various kinds of trades. In some cases the class of trade and the population of the commune fix the amount. In others there is a fixed special rate and additions for each workman employed."

An *Impot sur les valeurs Mobiliers* is also levied. A tax of four per cent. on shares of companies, home or foreign, yielded £2,600,000.

A tax of from 10 to 2½ per cent. on dwellings and places of business of one class, and of 6 per cent. to 2½ per cent. on those of another class, yielded 4 millions in 1885, for general revenue and the *centimes additionels* yielded about £2,800,000 for local purposes.

A personal tax, the equivalent of three days' labor from each man, calculated at from five pence to one shilling and three pence per day, yields £600,000 to £700,000.

Included in what is called the *patente* are the taxes on professional and other incomes. But Mr. Goschen, speaking of France, says that: "neither for imperial nor for local purposes is there an income tax properly so called."

The whole system differs materially from that of Great Britain. A table prepared by Mr. Goschen in 1871, in accordance with the information which he obtained from official sources in France through the interposition of the English foreign office, showed that the whole amount obtained from lands and houses by means of those taxes, considerably exceeded the whole amount expended by cities, departments and communes.

"Speaking broadly," Mr. Goschen says: "the departmental expenditure is equivalent to our county expenditure, and the communal expenditure to our other local expenditure."

PRUSSIA.

The several states of the German Empire collect a land tax. There is great difference in detail, but generally, the tax is based upon official valuation. The Prussian tax "was reformed" in 1810-20, and again in 1861, when the house tax was separated from the land tax; then the amount of the land tax alone was fixed at ten million thalers (£1,500,000). The acquisition of the new Prussian Provinces, in 1866, increased the amount to two million pounds. "The additional local taxes" says Bastable, "are not easily arrived at, but for the year 1880–1 the communal and provincial extra land taxes were equal to those of the state in amount (£2,000,000), giving a total burden on land of £4,000,000, independent of the income tax."

In 1889-90 the total tax on houses, at the rate of two to four per cent., amounted to £2,200,000.

Prussia taxes traders and manufacturers, hotel and inn-keepers and hand-workers who employ an assistant, according to four different scales regulated according to the population of the district in which they are situate or employed, and other circumstances. In 1877-8 this yielded about one million pounds. Agriculturists and the professional classes are exempt from this tax.

Until 1891 Prussia had what was known as a class tax. This was a substitute for the poll tax of 1811. The mass of the population was grouped into four classes, paying various rates from £1.16 to nine pence. This was mixed up with the income tax until 1851, when they were separated. The income tax was divided into twelve classes which, under the law of 1875, paid from three shillings to £3.12, incomes under £21 being exempted. "By the law of 1891 the class tax was absorbed in the income tax, and incomes under £60 were exempted." The rate is graduated so that at £525 it is three per cent. and at £5,000 it is four per cent. The estimated revenue from this source for 1889-90 was £4,000,000.

Prussian forests and industries yielded £2,800,000 net in 1889-90.

The gross receipts of railroads was 965 million marks, and the outlay including interest, on railway debt 769 millions.

Professor Rudolf Gneist, in an article on the government of Berlin, published in the *Contemporary Review* of December, 1884, says :

"The financial department of the state requires the co-operation of the communes in the assessment of the income tax which could not be properly levied without the assistance of communal assessment committees. Since the year 1815, a Berlin house and rent tax has been levied as the ordinary direct municipal tax, whilst the other towns of the monarchy exhibit a bewildering variety of systems of taxation, arising from the excessive autonomy of the German communes. This house and rent tax is levied, like the English poor rate, in proportion to the amount of actual rent, or a rent at which the tenement is reasonably expected to be let. Of this annual rent the owner of the property pays, at present, 2 and two-ninths per cent., a very low rate indeed; but it must be borne in mind that the state claims a house tax of 4 per cent. The occupier pays at present a tax of $6\frac{2}{3}$ per cent. of his rent; the tax of the smallest dwellings is often remitted.

"Thus ordinary city taxes used, in former times, to be raised from time to time when the other sources of revenue did not prove sufficient. For this, other sources were restrained to a modest share in the state tax on malt liquors, to a local tax on dogs and to several fees and duties. The excise, which used to be levied on meat and breadstuffs, had in modern times to be abandoned. So it became at last unavoidable to supply the budget by a direct urban income tax introduced by by-law of the city and raised according to the principles of the state income tax. The rate of this municipal income tax is at present quite as high as the state income tax (3 per cent. of the income) and the assessment combined with that of the latter."

The budget of the city of Berlin for the year 1881–2 shows the various sources of revenue.

Direct taxes	marks 23,133,468
Indirect taxes	646,884
From real property	642,871
From chattels	592,037
From establishments	4,373,158
Rent from public places	460,018
Sale of activa	205,724

Loans	marks 1,383,989
Grants and presents	2,373,676
Profit from street paving	983,081
School fees	1,451,468
Miscellaneous	1,833,477
Total	marks 38,079,851

The sewerage rate, of one per cent. of the annual rent, is not included in this budget. The cost of paving also appears to be met by a special tax which, in this year, yielded more than was expended in that work. [A mark is about a shilling sterling].

The municipality has several sources of income which are classed as remunerative works."

	Income.	Expenses.
Gas-works	13,317,702 marks.	9,331,000 marks.
Water-works	4,134,924 "	3,098,557 "
Canalization (sewerage)	10,843,634 "	9,466,184 "
Central cattle yard	1,776,673 "	1,419,074 "
Purchase and sale of land	1,928,361 "	1,728,837 "

Berlin has also a municipal savings bank with 32 branches which pays 3⅓ per cent. on deposits; a municipal fire insurance office in which city property is insured at a rate ranging from five to six pfennigs (½ d) per 100 marks (5£) and a municipal "Institute of Letters of Mortgage," which lends on the security of city property at 4, 4½ or 5 per cent. These institutions are said to work satisfactorily.

Bavaria, Baden and Wurtemburg tax capital, but the result is said not to be satisfactory. They also collect taxes on industry. Saxony in addition collects an income tax which, in its lower part, is practically a capitation tax. The income tax yields a revenue of £750,000. In some German cities *Octroi* duties are still collected.

AUSTRIA AND HUNGARY.

In Austria and Hungary *Octroi* duties are still collected and part of the proceeds goes to the state.

In 1879 the general land tax was fixed in Austria at 36,190,000 florins for 15 years. The local burdens were believed to reach a like amount, and the Hungarian land tax was supposed to be almost as large. The system of apportionment adopted in both secures a certain revenue, but is in some respects objectionable. In Austria, as in France, the general Government levies the taxes (*centimes additionels*) required for local purposes, and pays over the amount to the local authorities.

In Austria the house tax yields about three million pounds; in Hungary about one million.

Austria taxes industries five per cent. on the net gain, and salaries one to ten per cent. In 1883 these taxes yielded about £2,000,000.

BELGIUM AND HOLLAND.

Belgium in 1860 and Holland in 1866 abolished the *Octroi* duties. Belgium gave to the cities whose revenues were thus reduced, 75 per cent. of the proceeds of the coffee duty; 25 per cent. of the proceeds of the excise duties on sugar and wine and of the spirit duties, and 40 per cent. of postal receipts.

Belgium now has a land tax based upon an elaborate valuation which yields about £500,000 for national, and £300,000 for local purposes.

SWITZERLAND.

In some of the Swiss cantons the poll tax is still retained for local purposes.

All the cantons retain the "taxes on property and income," but no taxes of this class are imposed by the federal Government. The mode of taxation differs widely in the several cantons, but in all the income tax is graduated. In the canton of Zurich, incomes up to 500 francs are free, that being considered the "minimum of subsistence." Incomes from 500 to 1,500 francs are rated on one-fifth; the next 1,500 francs on two fifths; the next 3,000 francs on three-fifths, and the next 4,000 francs on four-fifths, and so on. An income of 12,500 francs would pay on 8,300 francs. The tax on personal property is so graduated that personalty valued at 10,000 francs pays on 5,000; valued at 100,000 francs, pays on 63,000, and valued at 200,000 francs, pays on 143,000.

Several of the cantons, especially the smaller, are essentially little else than municipalities. The cantons generally retain the poll tax.

SPAIN.

Spain abolished the *Octroi* system in 1868, but afterwards restored it.

The Spanish land tax is levied as well on the value of the stock as on the value of the land. The proportion fixed in 1890-91 was fifteen and a half per cent. on places that had given a satisfactory declaration (of values), and seventeen and a half per cent. on all others. As in France, Prussia and other countries a tax on land was levied for local purposes by the general Government in the same way as the tax for general purposes. It was estimated that the tax for general purposes would yield 115 million pesetas (£4,600,000) and the tax for local purposes seventeen million pesetas (£680,000).

PORTUGAL.

"Levies a land tax by apportionment closely on the lines of the French Impot Foncier." This yields about £650,000 a year. *Octroi* duties are collected at some of the cities, but they are not heavy and yield a small revenue.

ITALY.

The taxation is enormously heavy in this country as compared to its wealth. The municipalities derive a considerable portion of their revenues from the land tax collected by the general Government. The amounts collected from the lands in 1886-7 were:

National land tax	110,000,000 lire
Provincial " "	53,000,000 "
Communal	76,000,000 "
	239,000,000 lire = £9,200,000

This heavy tax is so badly adjusted or apportioned that in some communes the tax absorbs the greater part of the value of the land, and there have been many cases of eviction by the state. Laveleye, in his letters from Italy, states that from 1873 to 1878 no less than 35,074 small proprietors lost their properties by forced expropriations. In 1877 the number so expropriated was 6,444. The amount they owed was 662,722 francs.

Moveable wealth is taxed at the rate of 13.20 per cent or 2s. 7½d. in the £, and in 1890 this tax yielded over £9,000,000, so that it must have been thoroughly

enforced. An income tax reaches interest and other intangible property, as well as salaries, profits and professional earnings. Other very oppressive taxes were levied, the most obnoxious of which probably was the tax on "grists."

One of the tables prepared by Mr. Goschen shows what amount was raised for local purposes by taxation and otherwise in several countries of Europe in 1868, and what proportion of this amount was raised by the taxation of real property.

	Total local taxation.	percentage borne by real property.
England	£20,568,004	78.81
Scotland	1,500,000	75.00
Ireland	2,284,000	88.88
France	5,892,794	27.60
Russia	3,302,781	58.00
Holland	235,872	14.26
Belgium	272,617	17.07
Austria	808,485	53.02

The amount borne by real estate in France was so small because a large proportion of the whole revenues of several cities was derived from the *Octroi* duties. When this table was prepared *Octroi* duties were exacted in the cities of Holland and Belgium also.

UNITED STATES.

Connecticut.

The statutes of Connecticut enact that: "all property not exempted shall be liable to taxation as follows: (1) Dwelling houses with the buildings and lots appurtenant thereto, not exceeding two acres, and mills, stores, distilleries, buildings used for manufacturing purposes, and fisheries and property in fish ponds, designated and set out according to law, at their present true and actual valuation; (2) lands and separate lots, except house lots, at their average, present and actual valuation by the acre; (3) quarries, mines and ore beds, whether owned in fee or leased, at their present, true and actual valuation, and if owned by a corporation, the whole stock, property and franchise shall be set in the list of the town where such quarry, mine or ore bed is; (4) personal property not exempt shall, for the purpose of taxation, include all notes, bonds and stocks (not issued by the United States), moneys, credits, *choses* in action, and all vessels (except registered and enrolled sailing vessels), goods, chattels or effects or interest therein; and such property belonging to any resident in this State (Connecticut) shall be assessed at its then actual valuation, except when otherwise provided, but money secured by mortgage upon real estate in this State, when there is no agreement that the borrower shall pay the tax, shall be taxed only in the town where the real estate is situated. The provisions of this section shall not include money or property actually invested in merchandizing or manufacturing carried on *out of this state.*"

Registered and enrolled sailing vessels are to be assessed at a valuation equal to their net earnings during the preceding year, and it is provided that the assessment of any person need not include any property situated in another state, if such property is taxed in the state where it is; but this does not apply to

money loaned by residents of Connecticut to any party outside of said state, as money at interest; nor to bonds issued by, or loans made to any railroad company, located out of the state, when such bonds are owned and loans made by residents of the state.

Then follows a provision similar to that contained in section 26 of the Ontario Assessment Act, that property is to be assessed at its "actual valuation." The utter impossibility of dealing with local as distinguished from state taxation in almost every state of the union is fairly illustrated by a provision in the Connecticut Assessment Law, relating to the poll tax, which enacts that "every male person between the ages of 21 and 70 years shall pay a poll tax of $1, and no more for *town* and *state* taxes." There is nothing to show how this tax is apportioned between the town and the state. It is, however, evident that a poll tax is regarded as equally suitable for both *local* and *state* purposes. There are a number of exemptions from this tax, but it is intended to reach the great body of the people resident in the state. The exemptions from general taxation in Connecticut are numerous, but do not vary substantially from those allowed in Ontario.

Shares in the capital stock of any bank, national banking association, insurance, turnpike, bridge or plank road company, owned by any resident in this state, are to be assessed at their market value, but so much of the capital of any such company as may be invested in real estate, on which such company is assessed and pays a tax, is to be deducted from the market value of its stock in its returns to the assessors. In Ontario the shares held by any person in the capital stock of any incorporated or chartered bank doing business in the Province are exempt, sec. 7 (17), and the interest, dividend, or income only is liable to assessment.

In Connecticut there are numerous provisions with the object of compelling a disclosure of the information necessary for the purpose of a proper assessment of personalty in its various forms. These provisions, there as elsewhere, only partially succeed in accomplishing this object.

Water power is directed to be assessed as incidental to the machinery which is operated by it, and not separately as distinct property. The income tax does not appear to be in favor in the United States as a means of raising revenue, and in Connecticut no such tax is imposed. In some states of the union the assessment of realty is made at long intervals, but in the State of Connecticut it is directed to be made annually.

In Connecticut the cashier of every national banking association in the state is required annually, before a certain day mentioned in the Act, under a heavy penalty, to make a sworn return to the treasurer of the town in which the bank is established, of all its stockholders not residing within the State, the number of shares held by each and the market value of such shares, and he is also required within ten days of the making of such sworn return to pay such treasurer one per cent on such value. Then follow provisions with regard to railway and other corporations, which are required to pay to the *state* one per cent. of the value of their stock and one per cent. of the par value of the funded and floating indebtedness.

Corresponding provisions are also enacted with regard to express, telegraph and telephone companies, and the penalties for failing to make any of the returns or payments so required are very heavy. Connecticut is one of the States to which applies what has been elsewhere said as to moneys collected by the local authorities being partially devoted to State purposes. (*See* Statutes of Connecticut, 1888, Chaps. 241 to 244.)

MASSACHUSETTS.

The assessment law of Massachusetts, enacts that "all property, *real and personal*, of the "inhabitants of this state, not expressly exempted by law shall "be subject to taxation."

"Personal" estate for the purposes of the Act includes goods, chattels, money and effects wherever they are, ships and vessels, money at interest, and other debts due the person to be taxed more than they are indebted or pay interest for (but not including in such debts due any loan or mortgage of real estate, except the excess of such loan above the assessed value of the mortgaged real estate), public stocks and securities, stocks in turnpikes, bridges and moneyed corporations, within or without the state, the income from an annuity and so much of the income from a profession, trade or employment as exceeds the sum of two thousand dollars a year, but no income shall be taxed which is derived from property subject to taxation.

It is also provided that no taxes shall be assessed in any city or town for state, county or town purposes upon the shares in the capital stock of a corporation, organized or chartered in the commonwealth paying a tax on its corporate franchises under the provisions of a certain other Act of the Legislature, but such shares shall be taxable to the owners thereof for school, district, and parish purposes.

In addition to the assessment of real and personal property and incomes of over $2,000, a poll tax is directed to be levied of $1 on every male inhabitant of the commonwealth above the age of 20 years, and this tax may be applied either to state or county purposes.

Property in this state for the purposes of assessment is to be estimated at its "just value."

Recognizing the difficulty of securing a fair assessment of property of various descriptions, the disposition to evade taxation of every kind and the subterfuges resorted to, to accomplish this purpose, a number of stringent provisions have been enacted in Massachusetts directed against those who attempt to defeat the law in this particular. One of these provisions declares that "whoever with intent to defeat or evade the provisions of law in relation to the assessment or payment of taxes, delivers, or discloses to an assessor a false or fraudulent list, return, or schedule of property as, and for a true list of his estates not exempted from taxation, shall be punished by fine not exceeding one thousand dollars, or by imprisonment in jail not exceeding one year." The list of exemptions is dealt with elsewhere.

In Massachusetts the taxation of corporations for state purposes is the subject of a special Act of the Legislature. This Act provides, among other things, that every corporation established within the commonwealth shall make a return to the tax Commissioner on or before a given date, showing the whole number of their shares, the names and addresses of the shareholders and the "cash market value" of such shares.

All the shares of stock in banks are to be assessed to the owners thereof in the cities or towns where such banks are located whether such owner is a resident of such city or town or not, but the tax in the first instance is to be paid by the bank direct, and for the amount so paid in taxes, the bank is to have a lien on the shares as against the shareholders.

In Massachusetts, savings' banks are required to pay one-half of one per cent. on their deposits; and elaborate provisions are enacted with regard to the

taxation of "corporate franchises," including fire, marine, and life insurance companies, railway, telegraph and telephone corporations, trust companies and other associations, the object evidently being to compel them to pay an adequate tax for the special privileges they enjoy under the laws of the state (*See* Chapters 11, 12 and 13, Statutes of Massachusetts, 1882.)

MAINE.

The first section of the Act respecting the assessment and collection of taxes in the State of Maine, directs that "a poll tax shall be assessed upon every male inhabitant of the state above the age of 21 years, whether a citizen of the United States or an alien," and this tax is not to exceed $3. The second section establishes a principle of taxation no less general in its application, by virtue of which "all real property within the state, all personal property of "inhabitants of the state and (certain) personal property of persons not inhabit-"ants of the state, is subject to taxation," excepting only specified exemptions.

"Personal" estate for the purposes of taxation includes all goods, chattels, moneys, and effects wheresoever they are, all vessels at home or abroad, all obligations for money or other property, money at interest and debts due the person to be taxed more than they are owing, all public stocks and securities, all shares in moneyed and other corporations within or without the state, and all annuities payable to the person to be taxed when the capital of such annuity is not taxed in the State of Maine.

The capital stock of banks and other corporations is assessable. Ample provisions are made to compel managers and other officers of these institutions to make a full disclosure of all information required to enable assessors to discharge their duties, and the mode of collecting the tax upon such capital stock appears to be rather summary. The collector is to cause a written notice to be delivered to the cashier or president of the bank, stating the description of stock taxed, to whom assessed, and the tax thereon. No dividend is to be paid on such stock after such notice until the tax thereon is paid. The cashier may pay the tax, and such payment shall constitute a charge against any dividend thereon, but should the tax remain unpaid for ninety days, the collector may sell the stock in the manner prescribed in the Act. Then follow provisions regulating the taxation of railroad, telegraph, telephone, express and foreign insurance companies, and savings' banks, but as these are similar to those in force in Connecticut and Massachussetts which have already been described, they need not be referred to at length, especially as the tax on these is largely for State purposes.

There is, however, one feature of the law in this State to which reference may be made; the statute provides that when a tenant paying rent for real estate is taxed thereon, he may retain out of his rent *half* of the taxes so paid by him, and when a landlord is assessed for such real estate he may in the absence of any agreement to the contrary, recover from the tenant *half* of the taxes so paid by him. There are in Maine, as elsewhere in the United States, certain territorial divisions unknown to the municipal law of Ontario, such as "plantations" and "parishes," but the same principles of taxation apply in these as in the larger divisions. (*See* Chap. 6, Revised Statutes of Maine, 1883.)

MICHIGAN.

The "tax law" of this state by its first section, provides that "all property within the jurisdiction of this state not expressly exempted shall be subject to taxation."

For the purpose of taxation the term "real property" in Michigan is construed to include all lands within the state, and all buildings and fixtures thereon, and also all mortgages on real estate, deeds of trust, contract or other obligation, by virtue of which land in Michigan is pledged for the payment and discharge of any debt.

"Personal property" includes all goods and chattels, ships, boats and vessels, all shares in corporations organized under the laws of the state, including bank shares, and generally speaking all other property not included in the definition of real property.

The present assessment law of Michigan was only enacted in 1891, and under its provisions it is the duty of the assessing officer to "require every person of full age and sound mind to make and subscribe to a true and correct written statement under oath, of all the taxable property of such person, whether owned by him or held for use of another," and in every case when any person shall wilfully neglect or refuse to make out and deliver such sworn statement, said person is to be deemed guilty of a misdemeanor, and upon conviction thereof, is subject to a fine of $100 or thirty days in the county jail, or to both fine and imprisonment in the discretion of the court, and if the assessing officer is not satisfied of the correctness of any such sworn statement, he is empowered to examine anyone upon oath touching the property in question. Property is to be assessed for the purpose of taxation at its "cash value," and all "corporate property," except where some other provision is made by law, shall be assessed to the corporation, as to a natural person in the name of the corporation, and "the place where its principal office in the state is situated shall be deemed its residence."

The law also provides that: "A mortgage, deed of trust, contract or other "obligation by which a debt is secured by a lien upon real property within this "state, shall, for the purpose of assessment and taxation, be deemed and treated as "an interest in such real property, except as to the property of railroad and *quasi* "public corporations. In such case the value of the property affected by such "mortgage, deed of trust, contract or obligation, less the value of such security, "shall be assessed and taxed to the owner of the property, and the value of such "security shall be assessed and taxed to the owner thereof, in the county and "assessing district in which the property so affected is located. The taxes so "levied shall be a lien upon the property and security, and may be paid by either "party to such security. If paid by the mortgager (mortgagor) or holder of the real "property, such portion as was assessed to the mortgagee shall be considered and "treated as payment on any interest that may be due, or if there is no interest "due, then as a payment of so much principal.

"If paid by the mortgagee or holder of the security, such portion as was "assessed to the mortgager (mortgagor) or owner of the fee, shall become a lien "upon the land or real property, and be added to all other obligations and become "subject to the same terms and conditions as such mortgage or other property.

"*Provided*, that it shall not be lawful for either party to pay the portion of "the tax assessed to the other, until after the expiration of thirty days from the "time the warrant for the collection of the taxes has been placed in the hands of "the treasurer.

"*Provided further*, that if the said mortgagee shall neglect or refuse to pay "the tax assessed to him as the holder of any such mortgage, deed of trust, con-"tract or other obligation, the treasurer shall proceed to collect the same from the "mortgager (mortgagor) or holder of the said real estate, in the same manner as "is provided by law for collecting other taxes, and any delinquent tax accruing "by reason of the failure to collect the tax assessed upon any such mortgage,

"deed of trust, contract or other obligation, may be returned against the said "land in the same manner as other delinquent taxes. If any such security or "indebtedness shall be paid by any such debtor or debtors, after the tax shall "have become a lien upon the real property affected thereby, the amount of the "tax levied shall become an offset against such indebtedness. It shall be the "duty of the holder of any such mortgage, deed of trust, contract or other obliga- "tion, to file with the supervisor, or other assessing officer of the township or "assessing district in which the land or real property affected thereby, is situated, "before the 10th day of April of each year, a written statement under oath of all "his estate situated in such township or assessing district, liable to assessment "and taxation under the provisions of this Act, otherwise a written statement of "the mortgagee's interest in any such real estate, may be filed with the supervisor "by the mortgager (mortgagor) or owner of the fee. No mortgage, deed of trust, "contract or other obligation, by which any incumbrance upon real estate situated "in more than one assessing district shall be created, shall be accepted for record, "or recorded by any registrar of deeds within the state, unless there shall be "contained therein or appended thereto, a statement apportioning for purposes of "taxation, the incumbrance so secured by such real estate upon the separate "parcels of land included in such instrument for record, so as to shew the pro- "portionate amounts to be assessed as an interest on each parcel in the different "assessing districts.

"The obligor may include such apportionment in such instrument, but in case the "obligor shall fail to do so, the obligee or some authorized person in his behalf, "may append the statement of apportionment to such instrument." The exemptions are somewhat fewer than in most of the states and are as follows: (1) All public property belonging to the United States, the state of Michigan, or to any county, city, village, township or school district within the state. (2) The personal property of all benevolent, charitable, and scientific institutions incorporated under the laws of the state, and such real property as shall be occupied by them for the purposes for which they were incorporated. (3) All houses of public worship, with the land on which they stand, and also any parsonage owned by any religious society of this state and occupied as such. (4) All property of cemetery associations, and lands used exclusively as burial grounds. (5) Library or school books to the value of $150, and the personal wearing apparel of every individual, and all family pictures. (6) Household furniture to the value of $200, musical instruments not exceeding $150 in value, and other personal property used by any householder in his house ot the value of $200. (7) The real and personal property of persons, who, in the opinion of the supervisor are by reason of poverty unable to contribute towards public charges and (8) All mules, horses and cattle not over a year old, all sheep and swine not over six months old, and all domesticated birds and insects. (*See* Chap. 200, Laws of Michigan, 1891.)

NEW YORK.

The first section of the assessment law of New York State, provides that: "All lands and all personal estate within this state, whether owned by individuals or by corporations, shall be liable to taxation, subject to the exemptions hereinafter specified."

Personal property is defined to include, among other things, "public stocks and stocks in moneyed corporations."

All real and personal estate liable to taxation is to be estimated and assessed by the assessors at its full and true value, as they would appraise the same in payment of a just debt due from a solvent debtor.

In almost every other state of the union the persons liable to assessment are required to deliver to the officer making the assessment a sworn statement showing all the property of such persons liable to taxation, but in the State of New York it is the duty of the assessors to prepare the assessment roll after making a "diligent enquiry" as to the facts, and the assessors are required to swear to the correctness of the roll as is the practice in this province. Another similarity is to be found in the fact that, in assessing personal property the "just debts" owing by the persons and corporations so assessed, are to be deducted.

In New York as in many other states of the union special provisions are enacted respecting the taxation of corporations, joint stock companies and associations. Taxes raised from this source in New York are for the use of the state.

Every corporation, joint stock company or association, excepting banks and certain other corporations mentioned in the Act, is to be subject to and pay a tax "upon its corporate franchise or business" into the treasury of the state annually, to be computed as follows: "If the dividend or dividends made or declared by such corporation, joint stock company or association, during any year, amount to six or more than six per centum upon the par value of its capital stock, then the tax to be at the rate of one-quarter mill upon the capital stock for each one per centum of dividends so made or declared, or if no dividend be made or declared, or if the dividend made or declared do not amount to six per centum upon the par value of said capital stock, then the tax to be at the rate of one and one-half mills upon each dollar of the *valuation* of the said capital stock." Provision is also made for cases in which such company or corporation shall have issued more than one kind of stock, such for instance as common and preferred stock. Railroad, canal, steamboat, insurance and other corporations, are also subject to this Act, a slight variation being made in the rates, some of them paying five-tenths of one per centum upon the gross earnings, and in the case of certain insurance companies, eight-tenths of one per centum upon the gross amount of the premiums.

With regard to banks the ordinary law applies. The stockholders are assessed and taxed "on the value of their shares of stock therein," and such shares are to be included in the valuation of the personal property of such stockholders at the place, city, town or ward where such bank is located, subject to all the deductions and exceptions allowed by law in assessing the value of other taxable personal property owned by individual citizens of the state. The local authorities charged with such assessment are required, within ten days after completing such assessment, to give written notice to each bank of the assessment of the shares of its respective shareholders, and no personal or other notice to such shareholders individually is necessary for the purposes of the Act. Provision is made whereby the assessors can obtain the information necessary to enable them to make the assessment of bank shares, and the assessment when made is a lien on the stock, and the manager or other officer of the bank may pay the tax, and deduct the same from any accrued or accruing dividend. There is also an Act in the State of New York to "tax stock corporations for the privilege of organization," by virtue of which every corporation, joint stock company or association incorporated by or under any general or special law of the state having capital stock divided into shares, is required to pay to the state treasurer, for the use of the state, a tax of one-eighth of one per centum upon the amount of the capital stock which such corporation, joint stock company or association is authorized to have, and a like tax upon any subsequent increase thereof.

The Act further provides that such tax shall be deemed payable upon the incorporation of any such corporation, joint stock company or association, and no

such corporation, joint stock company or association shall have or exercise any corporate powers until such tax shall have been paid. The Act is not to apply to any literary, scientific, medical or religious corporation, or to corporations organized under the banking laws.

As has been pointed out in another part of this report, the assessment laws of the State of New York do not appear to have produced satisfactory results, and a committee of the legislature is now sitting for the purpose of enquiring into the whole question, but it has as yet issued no report. The chief ground of complaint is that a very large proportion of personalty in this state escapes taxation altogether, and it is even stated that not more than from ten to twenty per cent. of it is actually entered on the assessment rolls. The exemptions do not differ materially from those in other states. If, however, it be true that seventy-five or eighty per cent. of all the personalty in the state escapes taxation, the exemptions allowed by the statute, beyond showing the intention of the legislature, are of little consequence. (*See* Revised Statutes of New York, 1889, published by Banks & Brothers: 8th ed., Vol. II., Chap. 13.) *See also same volume, page 1580.*

OHIO.

In the assessment law of Ohio, we meet with this declaration: "All property, whether real or personal, in this state, and whether belonging to individuals or corporations, and all moneys, credits, investments in bonds, stocks or otherwise, of persons residing in this state, shall be subject to taxation, except only such as may be expressly exempted therefrom."

The definition as given in the statute, of the term "personal property," is altogether too long, to reproduce in full, and a synopsis is all that will be attempted in this place. For the purpose of assessment it is held to include every tangible thing being the subject of ownership, whether animate or inanimate, other than money, and not forming part of any parcel of real property and also the capital stock and undivided profits of every company whether incorporated or unincorporated. A technical definition of "money" and "credits" is also given, and persons liable to assessment are permitted to deduct the "legal *bona fide* debts owing by such persons," as in Ontario. Personal property is to be valued at its "usual selling price" for the purposes of the Act and "real estate" at its "true value in money," which is only another way of expressing the same thing. Persons liable to assessment, and even those who claim to be exempt, are required to make their returns or statements under oath, and adequate punishments are provided for those who are guilty of any irregularity.

Provisions are also enacted with regard to the taxation of banks, railroad, express and telegraph companies, but as there is nothing special in these provisions it is not deemed necessary to refer to them at length.

Ohio is one of the states in which, although the municipal authorities collect the taxes, a part of the same are paid over to the state. The law requires the state auditor annually on or before a given date to "give notice to each county "auditor of the rates per centum required by the general assembly to be levied "for the payment of the principal and interest of the public debt, for the support "of common schools, for defraying the expenses of the state, and for such other "purposes as shall be prescribed by law; which rates or per centum shall be "levied by the county auditor on the taxable property of each county on the "duplicate, and shall be entered in one column and denominated state taxes."

There is however one feature of the legislation of this state respecting taxation, which may be of interest, showing as it does the difficulty of obtaining a full and fair assessment.

The feature referred to is, the passage of an Act in 1888, entitled "An Act to secure a fuller and better return of property for taxation and prevent omissions of property, from tax duplicate." This Act authorizes the appointment of officers called "tax inquisitors," whose business it is to ferret out property which has not been assessed. Such officers must be remunerated out of the proceeds of taxation recovered through their instrumentality, and such remuneration is not to exceed 20 per cent. of the amount so recovered.

The whole subject is dealt with in eight chapters. Title XIII. of the Revised Statutes of Ohio, 1890.

VERMONT.

The assessment law of Vermont commences with a declaration that: "The polls of the male inhabitants of the state, citizens and aliens over 21 and under 70 years of age, shall be set in the list at $2 each, except the polls of persons actually poor or from whom a tax is not likely to be collected." And following this is a provision that: "All real and personal estate shall, except as otherwise provided be set in the list at one per cent. of its value in money, on the first day of April of the year of its appraisal."

The exemptions from taxation will be dealt with in their proper place, but it may here be stated that the law of Vermont expressly provides that "All manufacturing establishments hereafter erected, all quarries and mines hereafter opened by any individual company or corporation and all the machinery necessary for the prosecution of the business *all capital invested in and used for operating same*, together with all such machinery hereafter put into buildings, already erected but not now occupied, when the amount invested actually exceeds $1,000 shall be exempt from taxation for a term of five years.

There are provisions respecting the taxation of the capital stock of banks, "moneyed and other corporations," but they present no feature of special interest. There are also special provisions relating to the taxation of savings banks, trust corporations, express and telegraph companies; for state purposes only. Personal property is appraised yearly, but "real estate" is assessed "quadrennially." We find again in this state, minor territorial sub-divisions mentioned, such as "fire districts" and "gores," but these sub-divisions do not affect the principles of taxation. There are the usual provisions as to "oaths," to be taken by persons liable to assessment, and penalties are prescribed for those guilty of neglect or refusal to observe the law, and those who wilfully violate it are liable to punishment more or less severe, according to the degree of their guilt.

See Revised Laws of Vermont, 1880. Title IX. Chapters 22 to 26; *also secs.* 3593-7, *and secs.* 3662-3.

PROVINCE OF QUEBEC.

The municipal code of the Province of Quebec provides that every municipal council has the right to levy by direct taxation on all the taxable property, or only on all the taxable real estate of the municipality, as it may see fit, any sum of money required to defray the expenses of administration, or for any special purpose whatever within the scope of the functions of the council (article 489), and in the absence of any special declaration that the taxes are to be exclusively levied on real estate, it is provided that municipal taxes must be apportioned as well on the movable property as on the taxable real estate (article 937).

Municipalities are also empowered to levy annually, by way of personal taxes, upon the following persons: (1) Upon every tenant who pays rent, a sum not exceeding five cents in the dollar, upon the amount of his rent. (2) Upon

every male person of 21 years of age, residing in the municipality, and not otherwise taxed by virtue of said code, a sum not exceeding $1. The code also provides that the following property is taxable in every local municipality in which it is possessed, (a) the yearly salary or income derived from the office of every judge or other civil servant appointed by the Federal or Provincial Governments; (b) the annual professional income of every advocate, notary, physician, surgeon, dentist, civil engineer, or provincial land surveyor; (c) the annual salary of all other persons engaged in another's service, and whose salary exceeds $400 per annum. Crown lands occupied whether under or without location tickets, are deemed to be taxable property, but the municipal taxes for which they are liable cannot in any case be recovered from the Crown.

Article 582 of the code authorizes municipal councils to compel each of the following persons to take out a license from the corporation for the exercise in the municipality of his trade, occupation or calling, and to prevent the carrying on of such trade, occupation or calling without such license. (1) Every broker or banker, and every wholesale or retail trader, merchant and dealer residing in the municipality or not, except such persons as are obliged to take out licenses from the Government of the province, in so far only as relates to the particular business for which they must have such license. (2.) Every carter or common carrier. (No such license can be given for a longer period than 12 months.) The price fixed for granting any such license in virtue of this article must be proportioned to the extent of the business, trade, or occupation of each person bound to take a license, and fixed at the discretion of the council, but such price must not exceed $20 in the cases set forth in paragraph 1, and $12 in the case of paragraph 2. No municipal corporation shall, however, levy any tax upon any commercial traveller taking orders or selling goods, wares or merchandize by sample, catalogue or price list, or require any such person to procure a license from such municipal corporation, notwithstanding anything to the contrary in any statute.

Taxes upon Commercial Corporations.

In 1888 the Legislature of Quebec passed an Act imposing special taxes on commercial corporations for provincial purposes, and these taxes are of course in addition to the burdens already levied by the municipal authorities. The Act in question recites that in order to provide for the exigencies of the public service every one of the following companies and corporations doing business in the Province, namely: Every bank, insurance company, incorporated company carrying on any labor, trade or business in the Province, loan company, navigation company, telegraph and telephone company, city passenger railway or tramway company, and every railway company shall respectively pay annually the following taxes:

Banks.

(a) One hundred dollars on every one hundred thousand dollars, or fraction of one hundred thousand dollars of the paid up capital, up to one million dollars inclusively; fifty dollars for each one hundred thousand dollars or fraction of one hundred thousand dollars of the paid up capital from one million dollars to three million dollars inclusively; twenty-five dollars for each one hundred thousand dollars or fraction of one hundred thousand dollars, of the paid up capital from three million dollars to six million dollars inclusively, and fifteen dollars for each one hundred thousand dollars, or portion of one hundred thousand dollars, over six million dollars; except in the case of banks whose organization is outside of said Province, but which have branches or agencies in the Province, which shall

each pay a principal tax of a fixed amount of one-tenth of one per cent. upon the amount of the paid up capital if such capital is one million dollars or less, of one thousand dollars if the paid up capital exceeds one million dollars but does not exceed two million dollars, and of fifteen hundred dollars if the paid up capital exceeds two million dollars.

(b) An additional tax of one hundred dollars for each office or place of business in the cities of Montreal and Quebec and of twenty dollars for each office or place of business in any other place.

Insurance Companies.

(a) An insurance company carrying on the business of one kind of insurance only, $500.

(b) If carrying on the business of two or more kinds of insurance at the same time, $500 for the first and $50 for each of the others.

(c) Companies known as plate glass insurance companies shall each pay a tax of one-tenth of one per cent. upon the amount of their paid up capital.

(d) An additional tax of $100 for each place of business in Montreal and Quebec and $5 for each place of business in any other place.

(e) Every person acting as a broker for marine insurance companies, which do not carry on the business of insurance in the Province and have no office or place of business therein, shall pay a principal tax of $200 and an additional tax of $50 for each of his offices or places of business.

Loan Companies.

(a) A company with a fixed capital exceeding five hundred thousand dollars shall pay $400, with an additional sum of $50 for each million dollars or fraction of one million dollars of the paid up capital of the company over one million dollars.

If the fixed capital exceeds four hundred thousand dollars, but does not exceed five hundred thousand dollars, $300; if it exceeds three hundred thousand dollars, but does not exceed four hundred thousand dollars, $250; if it exceeds two hundred thousand dollars, but does not exceed three hundred thousand dollars, $200; if it exceeds one hundred thousand dollars, but does not exceed two hundred thousand dollars, $150; if the fixed capital is one hundred thousand dollars or less, one-tenth of one per cent. upon the amount of the capital.

(b) A company without a fixed capital, $100.

(c) An additional tax of $100 for each place of business in Montreal or Quebec, and of $50 for each place of business in every other place, when the fixed capital exceeds one hundred thousand dollars; when the fixed capital is one hundred thousand dollars or less, and when there is no fixed capital the additional tax shall be $50 for each place of business in Montreal and Quebec, and $25 for each place of business in every other place.

Navigation Companies.

(a) One-tenth of one per cent. upon the amount of the paid up capital up to five hundred thousand dollars inclusively, and $50 for every one hundred thousand dollars or fraction of one hundred thousand dollars, above five hundred thousand dollars.

(b) An additional tax of $50 for the most important office or place of business in each of the cities of Montreal and Quebec, and of $20 for the most important office or place of business in every other place.

TELEGRAPH COMPANIES.

(a) Every telegraph company and every other company working a telegraph line for the use of the public, one-tenth of one per cent. upon the amount of the paid up capital up to fifty thousand dollars.

(b) Two thousand dollars for every company, the paid up capital whereof exceeds fifty thousand dollars.

TELEPHONE COMPANIES.

One-tenth of one per cent. upon the amount of the paid up capital if it is fifty thousand dollars or less, and fifteen hundred dollars if it exceeds fifty thousand dollars.

CITY PASSENGER RAILWAY OR TRAMWAY COMPANIES.

$50 for each mile of single track of railway or tramway in operation and $100 for each mile of double track in operation.

RAILWAY COMPANIES.

(a) The railway companies mentioned in the schedule annexed to the Act, and including a part of the C. P. R. and the whole of the G. T. R. in the Province, and also including every railway company having received or receiving subsidies from the Government of the Province are required to pay $10 for each mile of railway in operation.

(b) All other railway companies, $5 for each mile of railway in operation.

OTHER INCORPORATED COMPANIES.

(a) Every incorporated company carrying on any labor, trade or business in said Province other than those hereinbefore mentioned, are required to pay one-tenth of one per cent. upon the amount of their paid up capital to one million dollars, and $25 for each one hundred thousand dollars or fraction of one hundred thousand dollars, for all sums over one million dollars.

(b) An additional tax of $50 for each place of business, factory or workshop in the cities of Montreal and Quebec, and of $25 for each place of business, factory or workshop in every other place. *(See R. S., Quebec, 1888, Vol. 1. Art. 1143-1153.)*

By an Act passed in 1892 every person or firm, other than incorporated companies engaged in or who desire to engage in the manufacture of any article of commerce, or in any manufacturing industry other than the manufacture of tobacco and cigars within the Province, is required so soon as his capital exceeds the sum of five thousand dollars to take out an annual license, for which he shall pay to the Provincial collector $50, if the capital employed does not exceed fifty thousand dollars.

If it exceeds fifty thousand dollars, but does not exceed one hundred thousand dollars, $100. If the capital employed exceeds one hundred thousand dollars, $150.

Tobacco and cigar manufacturers are required to take out a license annually based upon the annual value or rental of the premises occupied by such manufacturer according to the following rate:

If such rental is $300 or under	$100 00
Over $300 and not exceeding $400	150 00
Over $400 and not exceeding $600	250 00
Over $600 and not exceeding $800	400 00
Over $800	500 00

Then follow provisions applicable to every "shop-keeper, trader, person or firm other than an incorporated company who keeps a shop, carries on trade or business, or who sells or desires to sell within the Province by wholesale or retail, any timber, lumber, coal, tobacco, cigars, goods, wares or merchandise of any kind, and who is not liable to the tax payable by manufacturers, or who has not already taken out a license under the Quebec License Law for the sale of intoxicating liquors." These provisions regulate the annual tax which the several classes of persons therein mentioned are required to pay ranging in amount from $10 to $100. (*See 55-56 Vic., Quebec, Chap. 10.*)

Some of the provisions contained in the Acts cited above are, it is understood, likely to become the subject of litigation.

A further Act of the legislature of Quebec was also passed in 1892, entitled, "An Act respecting direct taxes upon certain persons," and reciting that the present revenue is insufficient to meet the increased expenditure and additional burdens of the Province, and that it is expedient and necessary to levy new taxes.

By virtue of this Act all members of the different liberal professions, namely: Advocates, notaries, physicians, dentists, land surveyors, civil engineers and architects practising their respective professions within the limits of the Province are required to pay to the collector of provincial revenue the following direct taxes:

1. Those who reside in incorporated cities and towns, an annual sum of $6 each.

2. Those who reside in other municipalities in the Province, an annual sum of $3 each.

3. All the members of the executive council, the members of the civil service and public employees and officers receiving a fixed salary are required to pay a direct tax of 2½ per cent. upon their respective salaries over $400.

There is also an Act imposing a tax on the transfer of real estate at the rate of one and a half cents on each dollar of the value of such real estate.

The Liquor License Act was revised in 1892 and the licenses increased.

MANITOBA.

The Municipal Assessment Act of 1891, of the Province of Manitoba, provides that all lands and personal property shall be liable to taxation subject to certain exemptions mentioned therein, and *personal* property is defined to include shares or stocks of incorporated companies. There is a clause in the Act directing that the personal property of an incorporated company or corporation shall be assessed against the company or corporation, and that ships and vessels or shares therein shall be assessed against the owners at their port of registry, and there is also a provision unknown to our own law, to the effect that all lands in rural municipalities improved for farming or gardening purposes, shall be assessed at the same value as such lands would be assessed, if unimproved, the object evidently being to attract agricultural settlers. When lands are improved for other purposes, even in rural municipalities, the value of such improvements are to be added to the assessment, and in the case of villages, towns and cities, assessments are to be so made that the burden of taxation will fall equally upon both real and personal property in proportion to their respective values.

In assessing stocks-in-trade the assessor may assess a person, firm or corporation doing business, for the amount of the average stock-in-trade kept on hand by such person, firm or corporation during the twelve months immediately prior

to the time of the assessment, and the person liable to assessment is bound to supply evidence of this average, no deduction being allowed on account of indebtedness therefor as in Ontario.

The exemptions are referred to under their appropriate heading.

There does not appear to be any authority in Manitoba to levy an income tax. The city of Winnipeg is governed by the general law, as amended by an Act passed in 1893, containing special provisions relating to Winnipeg, to which reference is made in another part of this report.

NEW BRUNSWICK.

No change in the law of New Brunswick, respecting taxation, has been made for a number of years, and the present law is found in the Consolidated Statutes of that Province prepared in 1877; the amendments since that time have been immaterial. The incidence of municipal taxation is regulated as follows:—

One-sixth part of the sum to be raised shall be levied by an equal rate as a poll tax on male persons of twenty-one years of age, and not being paupers, and the residue of the sum to be raised shall be levied upon the whole ratable property, real and personal, and ratable income, in just and equal proportions, according to the assessed value or amount of the same, and not upon any one or more kinds of property or income or subjects of assessment in particular, or in different proportions.

The list of exemptions, although somewhat shorter, does not materially differ from our own, except in one particular, and that has reference to church property, which does not appear by the general law to be exempt from taxation. By correspondence your Commissioners learned that although there was no statute law applicable to the entire province, authorizing the exemption from taxation of such property, it was tacitly understood that such exemption should be permitted, and, as a consequence, property of the character referred to is not assessed.

There is a provision to the effect that real and personal property shall be rated at its full cash value, subject, however, in the case of personal property, to a reduction for indebtedness.

Income is to be rated at its actual amount, and the statute declares that it shall not be subject to any deduction by reason either of indebtedness or expenses of living, but the income of a merchant arising from profits of business, shall be subject to a deduction equal to the interest upon so much of the value of his stock as is rated under the head of personal property. The only incomes absolutely exempt from taxation are those which do not exceed $200, and there is a further provision that the property, to the amount of $500, of a widow or unmarried female, or wife deserted by her husband, and compelled to earn her own living, shall also be exempt.

Personal property liable to assessment under the Act, is defined to include money at interest or otherwise, securities, notes, mortgages, debentures, accounts, public stocks, and all other property, except real estate and income.

Personal estate belonging to a joint stock or other corporation, having its principal place of business within the province, may be assessed in the parish where its principal place of business is situated, in the name of the corporation or of the president, manager, or agent thereof, but no stockholder of any joint stock corporation, as aforesaid assessed hereunder, shall be assessed for his stock, or income derived from such stock.

A foreign corporation having a place of business within the province must be assessed in respect of its personal property within the province, and upon its

income derived from its business within the province, in the same manner as to *personal* property, as a joint stock or other corporation having its principal place of business within the province, and as to its *income*, in the same manner as an inhabitant of the province.

Where any branch or agency of any business, carried on beyond the limits of the province, is established at any place within the province, no person assessed in respect of the said business carried on within the province, shall be liable to assessment on his interest in the general business abroad, either as personal estate or income, "but shall be liable to assessment only on real estate within the province, and on the personal estate employed within the province in such business, and income derived from within the province, and on investments made from earnings within the province wherever such investments may be."

The paid up capital stock of a joint stock company is to be assessed as personal property of the corporation, and at its correct value at the time of assessment, but the amount assessed on any real estate of such company is required for the purpose of assessment to be deducted from the value of such paid up capital stock.

NOVA SCOTIA.

The present Act relating to municipal assessments in the Province of Nova Scotia, was passed in 1888, and it is therein enacted that for all purposes for which local and direct taxes may be levied, all *land* and all such *personal property* and *income* as is defined in the said Act, shall be liable to taxation, and there is a provision to the effect that one-fourth and no more of all local and direct taxes shall be levied and assessed by an equal rate, as a poll tax, on all male persons living within the district of the age of twenty-one years and not being paupers; and the other three-fourths shall be levied and assessed upon the whole taxable real and personal property, and income of the locality to be taxed in proportion to the assessed value thereof, but such poll tax is not to exceed the sum of fifty cents on any individual, and the council in any municipality may order the whole amount to be levied and assessed solely upon real and personal estate and income. There is not sufficient dissimilarity between the exemptions in Ontario and Nova Scotia to justify a detailed statement of them. Attention may, however, be called to the fact that "personal property" defined in the Act includes all stocks of banks, public or private banking companies, or marine, life or fire insurance companies, or associations, or agencies of such banks, banking companies or associations, doing business within any municipality or incorporated town wherever the head office may be—to be assessed to such banks, banking companies, insurance companies, associations or agencies, and not to the individual stockholders. Such banks, companies, associations, and agencies, shall be rated as holding $100 of personal property for every $20 net annual income or profit derived from the business done by them at the place where the same is assessed, whether the profits of the year are declared or reserved, provided that in any incorporated town or district where there is a local bank or banks, and also one or more agencies, every such agency shall be assessed for an amount not less than the lowest amount assessed to any local bank in such place, provided, further, that in any district or town in which there is no local bank, the rate payable by any banking agency shall not be less than the sum of $150.

Ships and shares in ships or vessels are only to be assessed at *one half* their value.

Income is exempt to the extent of $400, but there is no provision in Nova Scotia corresponding to sub-section 21 of section 7 of our Assessment Act, whereby so much of the personal property of any person, as is equal to the just debts owed by him on account of such property, is exempt from taxation.

PRINCE EDWARD ISLAND.

The only Province of the Dominion not divided into municipalities is Prince Edward Island—the city of Charlottetown and the town of Summerside are the only two places on the island enjoying municipal institutions, and they are governed by special charters. In all other localities the work, which in Ontario is done by the municipal councils, is there undertaken by the general government. The sole exception to this rule is the school system. For the purposes of education the island is divided into school districts which appoint their own trustees who are authorized to collect a certain amount of taxation in each district for building purposes, etc., but the salaries of the school teachers are provided by the government.

With regard to both Charlottetown and Summerside, the taxes are principally raised by an assessment on real and personal property and a poll-tax; income is not assessed, but there are the usual special sources of revenue, such as police court fines and licenses of various descriptions. No special features present themselves; the exemptions include churches and educational institutions.

BRITISH COLUMBIA.

The Assessment Act of British Columbia provides that: "All land and personal property and income in the Province of British Columbia shall be liable to taxation," subject to certain exemptions. The term "personal property" includes income, goods and chattels, shares in incorporated companies, mortgages, dividends from stocks, money, notes, government or municipal bonds or securities, accounts and debts at their actual value, and all other property except real estate.

Then follows a provision that: "There shall be assessed, levied and collected from every person and paid to Her Majesty, her heirs and successors, the sums following:

"Two-thirds of one per cent. on the assessed value of real estate.

"One-half of one per cent. on the assessed value of personal property.

"Three-quarters of one per cent. on the income of every person of $1,500 and over;" and there is also a tax of two per cent. on the assessed value of what are called "wild lands" within the Province; these lands are defined to be lands upon which there shall not be existing improvements, when assessed, to the value of $2.50 per acre when situated west of the Cascades and $1.25 per acre when situated east of the Cascade Range of Mountains.

A specific tax is imposed on cattle and sheep depastured on Crown lands at the rate of 25 cents per head on all cattle (and the word "cattle" includes horses and mules as well as horned cattle) and five cents per head on all sheep.

There is also an Act imposing on every male person in the Province, over 18 years of age (with certain exceptions), a poll-tax of $3 annually.

The Municipal Act, 1892, of British Columbia, enacts that *land* within a municipality shall be estimated for the purpose of assessment at its actual cash value, as it would be appraised in payment of a just debt from a solvent debtor, but a distinction shall be made between *land* and the *improvements* thereon, and

the respective value of land and improvements thereon shall be estimated, for the purpose of assessment, separately, and *improvements* shall not be estimated for the purpose of assessment in excess of fifty per cent. of their value; and it shall be lawful for the council of any municipality to pass a by-law either exempting improvements altogether from assessment, or else providing that improvements shall be assessed at a rate of less than fifty per cent. of their value, but this provision does not apply to real property held by any railway company. The three chief cities of British Columbia, viz.: Victoria, Vancouver and New Westminster, are each governed by a special charter, but they contain no provision to which special reference need be made in this report.

TORONTO.

The total assessment of Toronto for the year 1892 was $152,952,936, made up as follows:

Assessed value of real estate	$136,584,003
" " personal estate	10,308,660
" " income	6,060,273
	$152,952,936

The above assessment was somewhat reduced on revision and as finally confirmed by the county judge amounted to $151,158,606. We were unable to obtain any information showing how the reduction affected real and personal property and income respectively, but the larger part of it may probably be referred to real estate. Upon the amount so confirmed a rate was struck of 14½ mills on the dollar, thus making the amount collectable as general taxes for said year $2,191,799. Toronto also derived from other sources last year a revenue of $747,907, of which the following were the principal items:

Waterworks revenue	$427,000
Rentals of city property	22,307
Liquor licenses	31,000
General city licenses	28,500
Market and weigh-house fees	26,000
Police court fines and fees	10,000
Revenue from street railway	120,000
Bell Telephone Company (percentage)	6,000
City registry office (proportion of fees)	9,000

thus giving Toronto a total civic revenue for last year of nearly $3,000,000 independent of the amount collected and expended for local improvments.

For the year 1893, although the assessment on real property has been somewhat increased, the total assessment, owing to causes hereinafter referred to, has been reduced by the sum of $392,571.

The figures which are taken from the assessment roll stand as follows:

Real Property.	Income.	Personal.	Total.
$138,619,813	$4,758,485	$8,535,024	$151,913,322

The assessment as confirmed by the county judge has been reduced to $150,766,035.

It will be observed that the reduction in income since last year is about one and a quarter million dollars, and in personal property about one and three-quarter millions. This reduction in income is accounted for by the recent change in the law by which the exemption on incomes has been increased. It may be as well, perhaps, to state here exactly what that change was. Previous to the session of the Legislature held in 1892, the annual income of any person derived from his personal earnings was exempt from assessment provided the same did not exceed $700, and the annual income of any person to the amount of $400 was also exempt no matter from what source it was derived, provided such income did not exceed $1,000. By the Act of 1892 the annual income of any person derived from his personal earnings up to $700, and the annual income of any person up to $400 derived from any source other than personal earnings, is absolutely exempt, *without regard to the total amount of the income in either case.* The effect of this provision necessarily is to reduce the aggregate amount assessable as income. It should, however, be stated that in no case is any greater sum than $700 exempt whether derived from personal earnings or from other sources of income or from the two combined.

The reduction in the amount of personalty is the result of a by-law passed by the city council which exempts from assessment the machinery, plant and tools used in every manufacturing industry in the city and but for these causes there can be little doubt that assessable income and personalty in Toronto would have kept pace with the increase in real estate to the extent at least of preserving its ratio as compared with the preceding year.

The estimated value of real estate exempt from taxation in Toronto, according to the last return, is $23,215,386, made up as follows :

Property of the Dominion	$1,991,576
" of Ontario	4,900,551
" of county of York	144,520
" of city of Toronto	5,566,021
" of charitable institutions	907,413
" of churches (all denominations)	4,806,661
" of separate schools and R.C. corporations	747,927
" of universities and colleges	3,361,320
Burying grounds	398,575
Hospitals	390,822
	$23,215,386

With a view of showing the relative value in Toronto of assessable real estate on the one hand and personalty and income on the other, for the last ten years, the following table has been prepared :

Year.	Real Property.	Income.	Personal Property	Total.
	$	$	$	$
1884	54,156,102	4,076,315	7,452,980	65,685,397
1885	57,546,816	4,105,412	7,572,886	69,225,114
1886	60,695,505	4,338,025	7,682,003	72,715,533
1887	69,442,018	5,265,585	8,849,208	83,556,811
1888	84,256,933	4,906,097	9,132,821	98,295,851
1889	102,382,405	4,832,733	8,999,065	116,214,203
1890	122,651,244	5,108,546	9,470,988	137,230,778
1891	132,402,383	5,526,789	9,846,676	147,775,848
1892	136,584,003	6,060,273	10,308,660	152,952,936
1893	138,619,813	4,758,485	8,535,024	151,913,322

It should be stated that the foregoing table is taken from the assessment rolls for the respective years, and that the totals given were somewhat reduced on appeal in each year, although relatively the amounts remained about the same.

To enable a comparison to be made with cities in the United States and elsewhere, we append a table showing from the latest returns the relative assessed values of real estate and personal property (including income where such is assessed) in ten cities.

Name of City.	Real Estate.	Personal Property, including Income, where such is assesssed.
	$	$
Boston	680,279,875	213,695,829
Cleveland	91,782,150	29,498,065
Baltimore	212,763,173	67,976,093
Detroit	149,372,700	35,554,430
Rochester	96,543,650	6,609,302
Portland, (Me.)	24,299,000	12,643,450
Buffalo	183,254,870	13,829,910
St. John, N. B.	12,369,800	12,186,000
Halifax, N. S.	15,212,150	4,909,000
Toronto	138,619,813	13,293,509

NOTE. It will be observed that the greatest disproportion in value between real estate and personal property exists in the case of Rochester, the ratio there being 16 to 1, and next in order comes Buffalo with 14 to 1. Toronto is 10½ to 1. In Boston and Cleveland the ratio is about 3 to 1, while in St. John, N.B., it is just about equal. Montreal was omitted from this table for the reason that neither personal property nor income is assessed in that city. It was intended in the first instance to add a column showing the estimated value of exemptions in each city, but this had to be abandoned owing to the impossibility of obtaining correct returns in this particular.

MONTREAL.

The civic system of the City of Montreal as compared with Toronto, presents many points of contrast. To begin with, it is governed by a special charter which was revised in 1889, and which now contains some 435 clauses. The total revenue of the city for the year 1891 was $2,440,076, of which the following were the principal items:

Assessment on real estate 1 per cent. for municipal purposes and one-fifth of 1 per cent. for schools	$1,027,920.16
Business duty and personal taxes	188,466.57
Water rates	615,833.01
Market returns	85,534.33
Police licenses	81,370.00
Recorder's court fines	23,445.91

and the balance is made up of certain arrears of taxes and miscellaneous sums.

Under its charter the city council is empowered to make by-laws and impose and levy an assessment on immovable property liable to taxation in the city, not to exceed one and a quarter per cent. of the assessed value of such property, for which assessment the owner is personally liable.

Then follow in order provisions authorizing (1), a "business tax," on all trades, manufactures, occupations, businesses, arts, professions, or means of profit

or livelihood carried on or exercised within the city, not exceeding 7½ per cent. on the annual value of the premises in which such trades, manufactures, etc., are respectively carried on. (2) A special tax not to exceed $400 on every fire insurance company doing business in the city. (3) A special tax not exceeding $200 on every life, marine, accident or guarantee insurance company. (4) A special tax not exceeding $400 on every bank doing business in the city, with a paid up capital of one million dollars, or less. A tax not exceeding $500 on every such bank, the paid up capital of which is more than one million, but does not exceed two million dollars, and a tax not exceeding $600 on every such bank, the paid up capital of which is over two million dollars. (5) A special tax not to exceed $5,000 upon every gas company; and upon every electric telegraph, telephone or electric light company, a special tax not to exceed $400. And every special tax aforesaid is to be paid in addition to the business tax, wherever such business tax is payable. The foregoing are the principal special taxes authorized by the charter, but there are a number of minor ones which it is not thought necessary to enumerate. No taxes whatever are imposed either on incomes or personal property.

With a view of ascertaining whether the system worked satisfactorily to all classes of the ratepayers, your Commissioners thought it expedient to place themselves in communication with some civic official, who could speak with authority on that point, and correspondence was accordingly opened with the treasurer of the city, who in replying to the enquiry, says: "From a civic standpoint, I consider the answer to be yes, but from a purely landlords' standpoint, especially a landlord with a large percentage of vacant houses, the answer would be emphatically, no."

The figures given above are taken from the treasurer's report for 1891, which shows that the net assessed value of realty for that year was $107,247,980, while the total value of the exemptions was $21,165,020. The assessment for 1892 has however increased the figures under both these headings, the realty being placed at $114,000,000, and the exemptions at $23,000,000.

For the purpose of comparison it may be stated here, that real estate in Toronto, which is also supposed to be estimated at its full value, was in 1892 assessed at $136,584,003.

Assessments in Montreal are made annually by a board of assessors. The charter requires property liable to taxation to be assessed at its full cash value, but enquiry shows that in practice, it is not valued at more than seventy-five per cent. of its actual worth. The fact must not be overlooked that the taxes above mentioned imposed by the city council are not the only direct taxes levied in Montreal. The legislature of the province imposes heavy additional burdens by direct taxation for provincial purposes. In dealing with the assessment law of the province of Quebec these are referred to at length.

QUEBEC CITY.

The City of Quebec is governed by a special Charter which was originally granted in 1840. This was several times amended and in 1865 the statutory enactments relating to the subject were consolidated and this legislation and the amendments thereto, which are very numerous, constitute the Charter of to-day.

Quebec derives her revenue chiefly from three sources, as follows:

1. Assessment of realty.
2. Business tax. 3. Personal tax.

There is no tax imposed on either personal property or income as such.

From a by-law passed by the city council on the 1st day of May, 1892, we

find that the rate imposed on real estate for the then ensuing civic year was three-quarters of one per cent. of the real assessed value which is arrived at in the following manner: When a house or lot of land is occupied, otherwise than by the owner thereof, at a stipulated rent, such rent is capitalized at 5 per cent. to establish the assessable value and $\frac{3}{4}$ of 1 per cent. is imposed on the capitalized sum, which is equivalent to 15 per cent. on the annual rental value, and when occupied by the owner it is the duty of the assessor to determine what the property would rent for and assess it according to the same rule. Then there is a personal tax of $2 per head annually imposed on all persons doing business or employed in the city at any trade, profession or any other means of livelihood; this tax last year yielded something over $50,000.

The "business tax" is a charge of 12½ per cent. upon the rental of the property used for business purposes.

The section of the By-law imposing this tax is as follows:

"An annual duty or tax is hereby imposed upon and shall be paid, in each and every year, by each and every person or firm of persons being wholesale merchants, or dealers, or retail merchants or dealers, or wholesale and retail dealers in goods, wares and merchandises of any kind or retail dealers in spirituous liquors (not being tavern keepers) or forwarding merchants or forwarders, or the agents of merchants, traders, forwarding merchants or forwarders, or being express agents, brokers, apothecaries, chemists or druggists, or being inspectors of pot and pearl ashes, lumber, deal, beef, pork, flour, butter, leather, or any other kind or description of merchandise, manufacture, produce or any provision whatsoever, or being or carrying on the business of lumber merchants or dealers in wood or keepers of a lumber yard, with or without steam or water power, or being or carrying on the business of merchant tailors, boot and shoe makers, saddlers, and harness-makers, stone cutters, tin-smiths, confectioners, bakers, coffee house keepers, cabinet-makers, upholsterers or undertakers, dyers, founders, ginger-beer, root-beer or spruce-beer brewers, soda-water makers, hair dressers or barbers, ink or blacking manufacturers, gold-smiths, silver-smiths, jewellers, gold and foil beaters, soap and candle manufacturers, oil manufacturers, book-binders, printers, shipbuilders, cullers, gilders and frame makers, painters and glaziers, pump and block makers, wire workers, brush makers, chair makers, tobacconists, coach and carriage makers, comb makers, furriers, hatters, musical instrument makers, tanners, lawyers, notaries, doctors, physicians or surgeons, dentists, surveyors, architects, artists, miniature or portrait painters, collectors, accountants, bailiffs, in the City of Quebec and generally, on all trades, manufactories, businesses, arts, professions, means of profit, livelihood or gain, whether hereinbefore enumerated or not, which now are or may hereafter be carried on, exercised or put in operation within the said city; and on all persons by whom the same are or may be carried on exercised or put in operation therein, either on their own account or as agents for others; at the rate of fifty dollars for every four hundred dollars of the assessed yearly value of the premises occupied and used by any and every such person or firm of persons, for the purposes aforesaid and at and after the same rate for every greater or less sum of such value as aforesaid."

A considerable revenue is derived from liquor licenses and from other specific taxes of which the following are the principal: an annual tax of $800 on telegraph companies, $1,000 on banks, $500 each on insurance companies, brewers and distillers; and when special taxes are imposed the "business tax" is not collected. While the above are the only features in the municipal system of taxation in the City of Quebec requiring special notice in this report, it must not be forgotten that

the government of Quebec also imposes heavy direct taxation for provincial purposes, a full account of which will be found in the review of the assessment law of that province.

HALIFAX, N.S.

An Act to amend and consolidate the charter of the City of Halifax was passed in 1891, and as the basis of taxation it provides that, "the assessment shall be rated on the owners of real and personal property by an equal dollar rate upon the value of such real and personal property within the city," and this provision applies as well to joint stock companies as to private individuals.

All moneys advanced on real estate security are exempt from assessment.

Every company, corporation, association or agency (excepting those specially dealt with), in addition to being assessed on their real and personal property are required to pay to the city an annual license fee varying from $50 to $200. Joint stock banks for the purpose of assessment are dealt with under the following provisions: "Every incorporated joint stock bank, whose chief place of business is situated in the City of Halifax, shall be assessed in respect of the real estate in said city, owned by the said bank, in the same way as other ratepayers, and it shall pay to the City of Halifax annually in addition thereto, a tax of three-eighths per cent. of the amount of its paid up capital after deducting from said capital the assessed value of said real estate. Every other incorporated joint stock bank doing business in the City of Halifax by means of an agency or branch office, shall be assessed in like manner in respect of the real estate in said city, owned by said bank, and shall annually pay to the City of Halifax in addition thereto, a tax equal in amount to the smallest tax hereby required to be paid in respect of capital by any bank whose chief place of business is in the City of Halifax."

The banking capital, on which the city is entitled to receive, three-eighths of one per cent. is $4,500,000, and if to this is added the assessment of other personalty, which last year amounted to $4,909,000, and the assessed value of realty for the same year $15,212,150, we get a total of $24,621,150. It should be stated that the tax to be paid on banking capital is fixed by statute at the rate above mentioned, whilst on other classes of property a rate was struck of $1.49 on every $100.

There is imposed on persons, who are not assessed on property of the value of $200, a poll tax of $2, but as there is a provision that no person shall be assessed on his personal property unless its value amounts to $200, the poll tax is merely a means of compelling contributions from those who take advantage of the provisions just mentioned, and last year the city received $2,000 from this source.

The exemptions from taxation in Halifax are of the usual kind, and any special reference to them is therefore unnecessary; it should however be stated that incomes are not assessed.

ST. JOHN, N.B.

The City of St. John in its civic revenue presents one unique feature, in as much as it collects from its personal property and income tax together, about the same amount as is realized from real estate.

According to the latest returns available, the entire assessment amounted to about $25,000,000, made up as follows:

Real estate	$12,369,800
Personal property	8,350,700
Income	3,835,300

upon which a rate of one and one-half per cent. was struck for the year 1892,

to which has to be added the receipts from licenses and the rentals of civic property.

St. John is governed by a special charter, under which Portland and St. John are united as one corporation. This charter is comprised in chapter 27, of the statutes of New Brunswick, passed in 1889. By virtue of the provisions therein contained, the city assessors are required each year to "make a fair and just valuation, in their best judgment, of all the real estate and personal estate and other property subject to taxation," and persons liable to taxation are required to make out a statement in writing, in the form given in the Act showing truly and specifically the value of their real estate, personal property and income derived from any source, other than from their real or personal property aforesaid. And the Act provides that "the assessor shall in all cases require a person bringing in such a statement to make oath that the same is true," but no such statement although under oath is to bind the assessors or excuse them from making due enquiry to ascertain its correctness. There is a special provision relating to joint stock companies established abroad, but doing business in St. John: these are to be rated and assessed upon the gross and total income received for such company, deducting only therefrom the reasonable costs of management of the business and the whole amount of income after such reasonable deduction, has been made, is to be capitalized for assessment as personal estate, according to the following basis: every dollar of such ratable income is to be held to represent, and is to be valued at five dollars of capital, and the amount so capitalized is to be assessed at its full value as personal estate, of the agent or manager, for the purpose of assessment. This provision also applies to persons having their chief place of business elsewhere than in the province and doing business in St. John.

All other joint stock companies or corporations are to be assessed in like manner as private individuals, the shares or stock in such companies or corporations are to be assessed at their actual value, and in assessing personal property no abatement is allowed for indebtedness.

The only other feature appearing to call for notice, is that there is levied "a poll tax of $2 upon all male inhabitants of the city of the full age of 21 years not being paupers." The exemptions in St. John are of the usual kind. Of the property exempt, the value of that belonging to the dominion, province, county and city is not given; but the churches, educational, literary and charitable institutions which are also exempt are estimated at $2,332,800.

WINNIPEG, MAN.

The city of Winnipeg is subject to the general municipal law of the Province of Manitoba except in the matter of taxation. By an Act of the Legislature, assented to March 11th, 1893, it is provided that "Hereafter no personal estate or personal property in the city of Winnipeg shall be liable to taxation under the Assessment Act, nor shall be assessed by the assessors of the said city for taxation purposes," and in lieu of the general law governing taxation throughout the province, the following special provisions are enacted relating to Winnipeg only:

(1) All buildings upon real estate in the said city, whether owned by the owner of the real estate or by other persons, and all buildings which may be considered as tenant fixtures and liable to removal by persons other than the owners of the real estate, shall be deemed and construed, for the purpose of this Act, to be real estate, and shall be assessed along with the real estate to the owner of the latter.

(2) All pipes and other properties of gas and water companies which have been heretofore, and which shall be hereafter fixed in, on or under the streets of the said city shall, for the purpose of this Act, be deemed real estate.

(3) The lines of track, rails and other property of street railways which have heretofore been fixed and placed, or which may hereafter be fixed or placed in, on or upon any of the streets of the said city shall be deemed, for the purpose of this Act, to be real estate.

(4) All poles, wire and other property and appliances of any electric light, electric power, telegraph or telephone company, placed in, upon or above the streets of the said city shall, for the purpose of this Act, be deemed real estate.

(5) Every person, firm, partnership, company or corporate body that carries on business in any way in the said city as merchant, trader, manufacturer, banker, broker, money changer, lawyer, physician, dentist, photographer, auctioneer, grocer, baker, butcher, huckster, mechanic, pawnbroker, livery stable keeper, tanner, land agent, commission agent, ticket agent, ticket seller, telegraph agent, telephone agent, inspector of any kind, agent of any kind, or who carries on an insurance business of any kind, or acts as agent for any of the above-mentioned businesses, or who carries on any other business, trade, occupation, manufactory, art or profession not above detailed, shall be assessed for a sum, by way of capitalization of the rental value of the premises which he so occupies in carrying on any of the businesses, professions, employments or callings above mentioned, or which he uses for an office for such business, profession, employment or calling, and both thereof, to the end and intent that all persons and corporations occupying premises not solely used as a residence for the person or corporation so occupying the same shall be liable to taxation for a sum equivalent to the capitalized rental value of the premises so occupied:

(*a*) In arriving at the amount to which such person shall be assessed, as above mentioned, the assessor shall capitalize the annual rental value and fix the amount at such sum that the rate fixed by the said city in the year last preceding, for all the purposes of the said city, including school tax, will produce a sum which shall equal ten per centum of the yearly rental value of the premises so occupied at the time of the assessment, subject, however, to the following provisions:

(*b*) In all cases where the rental value of the premises shall exceed 75 cents per square foot of the floor surface of the building, or part of the building occupied by the person so assessed, the assessor, in fixing the amount of capitalization above mentioned, shall fix the sum of $3.75 per square foot for such floor surface; and in estimating the floor surface for the assessment above mentioned the assessor shall compute the measurement from the inside of the walls of the building or apartment so occupied, measuring the entire superficial floor area within and each of the floors thereof so occupied: cellars used, however, by the party so assessed under the premises so occupied, having no outside entrance for ingress and egress of customers, shall not be included in this measurement, except when the floor area thereof exceeds the floor area above described. In case of such excess the floor area of the cellar to the extent of such excess shall also be assessed at the rate aforesaid against the occupant, to the end and intent that the occupant of the premises, whether he uses such cellar in connection with his premises or not, shall not be assessed upon a capitalization of rental which shall exceed $3.75 per

annum for each square foot of the floor surface of the premises occupied by him, not measuring such cellar except in case of excess cellar space as above provided for:

(*c*) In all cases where the rental value of the premises shall be less than 30 cents per square foot of the floor surface of the building or part of building occupied by the person so assessed, the assessor, in fixing the amount of capitalization above mentioned, shall fix the sum of $1.50 per square foot for such floor surface; and in estimating the floor surface for the assessment above mentioned the assessor shall compute the measurement from the inside of the walls of the building or apartment so occupied, measuring the superficial floor area within and each of the floors thereof so occupied: cellars, used, however, by the party so assessed under the premises so occupied, having no outside entrance for ingress and egress of customers shall not be included in this measurement, to the end and intent that the occupant of the premises, whether he uses such cellar in connection with his premises or not, shall not be assessed upon a capitalization of rent which shall be less than $1.50 per annum for each square foot of the floor surface of the premises occupied by him, not measuring such cellar:

(*d*) Persons using and occupying premises for the following purposes shall be assessed in the manner provided in paragraph (*a*) of this section, and paragraphs (*b*) and (*c*), shall not, nor shall either thereof, apply to any such persons, viz.:

I. Offices and warehouses of auctioneers who are licensed as such by the said city.

II. Manufacturers whose establishments so assessed are chiefly and principally employed in manufacture or in mechanical labor.

III. Livery stable, and feed and sale stable keepers, and stables of street car companies, transportation companies' stables, and all other stables liable to taxation under this Act.

IV. Persons occupying floors of buildings above the ground floor, who do not, in connection with such occupation, use or occupy any portion of the ground floor on, or about on, the street level.

V. Occupants of wood, coal, lumber, brick or stone yards, or any other yard used for storage or for carrying on any business or any cattle or stock yards, and all buildings on the same premises used in connection therewith.

VI. Ice houses and storehouses for ice and offices in connection therewith.

VII. Skating, curling and other rinks, whether enclosed or not.

VIII. Warehouses and other premises used solely to warehouse goods where the goods are not open to inspection by customers and where the chief office or place of business of the occupant is not in the building so assessed.

(*e*) The occupant of every licensed hotel shall be assessed for a gross sum by way of rental capitalization which shall be equal to $3.75 per square foot for all the floor space occupied by the bar-room, billiard-room and drinking rooms or stalls used as such in connection with the bar and billiard rooms, and in computing this space, the assessor shall measure from the inside walls of the entire portion of the building so occupied and include all closets, halls and spaces within such walls, and except as aforesaid no licensed hotel shall be assessed by way of capitalization of rental.

This section shall not apply to any opera house, theatre, public hall, place of public amusement, place used for public meetings only, or any hall or place of meeting for secret, political, friendly or other societies or bodies of people, or to any temperance hotel or boarding house.

(6) Every occupant of any building liable to taxation as set forth in this Act shall be liable for such assessment although he be the owner of the premises and liable to taxation as the owner of the real estate and the buildings.

(7) The Assessor in assessing the properties of water-works, street railway, telegraph, telephone, gas, electric light and electric power companies, which are in, upon or above the streets of the said city as hereinbefore mentioned, and the engine, boiler, dynamo and other plant used in the power house, generating house or building used in pumping, generating power, electricity or gas, shall not be called upon to value and shall not value the same, but shall assess by entering in the assessment roll in each year the value of such properties so in, upon and above the streets and the said plant in the said buildings in the following gross amounts:

(*a*) Each gas company or gas and electric light company the gross sum of $60,000.

(*b*) Each electric light company the sum of $40,000.

(*c*) Each telephone company the sum of $30,000.

(*d*) Each water and water-works company the sum of $150,000.

(*e*) Each street railway company the sum of $40,000.

(*f*) Each telegraph company the sum of $15,000.

(8) The values set out in the preceding section are based upon a population of the said city of in the neighborhood of 30,000 people, and as soon as shown by the assessment roll census of the said city that the population of the said city shall have reached 35,000, the assessor shall add to each of such gross sums a sum equalling 15 per centum of each thereof and for each additional increase of 5,000 to the 35,000 above mentioned of inhabitants as shown by such census the assessor for the following year shall add to the next previous assessment 15 per centum of the original assessment as fixed by section 7 of this Act.

(9) None of the companies referred to in section 7 of this Act, shall be assessed by way of capitalization of rental for any building or premises used by them solely for the generation of power in which the plant and machinery is exempted by this Act. But nevertheless telegraph and telephone companies shall be liable to assessment by way of capitalization of rental for the offices and other premises occupied.

There is also a provision in the Act that nothing therein contained shall be construed to make the tax levied upon occupants a charge upon the real estate or building occupied, such tax being levied "in lieu of a tax upon personal property."

The effect of the change is to substitute what is called a "business tax" for a tax on personal property, leaving the tax on real estate, including the buildings thereon, as it was before.

As the question of taxation is now everywhere attracting unusual attention, this experiment will no doubt be watched with more than a passing interest.

The new law goes into operation immediately.

BOSTON, MASS.

The City of Boston presents the same features, with regard to taxation, as are to be found almost everywhere else in the United States. Real and personal property are the chief sources from which the revenue is drawn, and incomes of professional men and others not derived from property liable to assessment (and not being less than $2,000) are subject to taxation.

In our review of the assessment law of Massachusetts, attention is called to the fact that a special law has been enacted in that state governing the taxation of corporations. Under the general law, which is applicable to Boston, no personal property other than machinery can legally be assessed to a Massachusetts' corporation; but personal property of every other kind is liable, and as a consequence the personalty returned for assessment—notwithstanding the exemptions in favor of corporations—equals nearly one-third of the realty. The figures for 1892 are as follows:

Assessed value of realty	$680,279,875
Assessed value of personalty	213,695,829

The rate levied for the year was $1.29 per $100. Boston, in addition, collects a poll tax of $1 on all male persons over 20 years of age, and females who wish to enjoy certain privileges must also pay this tax. According to the latest returns 135,590 persons were assessed in the city under this head.

The estimated value of stock of corporations assessed by the state but on which the tax is paid to the city is given at $54,317,600, and the valuation of national bank shares assessed and paid in the same way is $1,584,100.

It is unnecessary to set out in detail the property in Boston exempt from taxation as it corresponds in character with exemptions in Ontario and elsewhere. The churches, charitable, scientific and literary institutions, which are exempt, are alone valued at $44,929,900, and this is only a partial list. *See* Chapters 11 and 13 of the Public Statutes of Massachusetts, 1882.

ROCHESTER, N. Y.

The system of taxation in force in Rochester presents no new feature either as to the subject matter of the municipal tax or the mode of collecting it.

It is, however, worthy of remark that the personal property assessed bears an unusually small proportion to the realty. The figures for last year are as follows:

Realty assessed	$96,543,650
Personalty assessed	6,609,302

Incomes are not assessed and the rate levied was $1.54 per $100.

Rochester received from its water-works' fund last year $264,488, and from the police department $7,807.

There are the usual exemptions from taxation in Rochester including churches and schools, but no valuation is made of them.

PORTLAND, ME.

The chief source of revenue in the City of Portland is a tax on real and personal property. In 1891 the returns stood as follows :

Real estate	$23,494,600
Personal estate	13,088,695
Total	$36,583,295

In 1892 the valuation of realty had increased by about three-quarters of a million and the personalty had decreased by nearly half a million. The figures are as follows :

Real estate	$24,299,000
Personal estate	12,643,450
Total	$36,942,450

Upon which there was levied a rate of $1.95 per $100. The city also received, last year, under the head of "Liquor Agency," the sum of $57,333 ; the total revenue from all sources being $1,182,219.

The railroad and telegraph tax is collected by the state and the city of Portland received from the state treasurer, as its share of this tax, for last year only $3,754.

No income tax is collected in Portland, and the exemptions are of the ordinary kind including churches and charitable institutions the value of which is not given.

PHILADELPHIA.

It is often said that in Philadelphia only real estate and horses and carriages are taxed, but the fact is, that in addition to the revenue derived from these sources, *three-fourths* of the tax collected by the state from the residents of Philadelphia on *personal* property is paid over to the city corporation, and this, last year, amounted to no less a sum than $800,000.

A very large revenue is also obtained from the various city departments under the head of gas, water licenses, etc.

The state also makes an annual appropriation to the city for the maintenance of the public schools.

The rate imposed on real estate in Philadelphia for a number of years past has been $1.85 per cent. on the assessed value.

BUSINESS TAX.

The business tax, based on the annual value of the premises in which the business is carried on, seems to meet with approbation in certain quarters, and the imposition of such a tax, in lieu of the taxation of personal property belonging to such business, has in Ontario been rendered optional with the municipal councils throughout the Province by the following section in the Assessment Act (*See* sec. 31*a*.) :

"In the case of persons carrying on a mercantile business in a municipality the council of the municipality may pass a by-law or by-laws for imposing and

levying an annual business tax in respect of all classes of mercantile business, without classification or of any class or classes of mercantile business, provided that such business tax does not exceed seven and a half per cent. of the annual value of the premises in which the business is carried on; and the council may in their by-law classify different kinds of mercantile business and fix the business tax on the respective classes at such a percentage on the annual value of the premises occupied within the limits provided by this section as to the council may seem reasonable; and provided also that when a business tax is imposed the personal property belonging to the business, in respect of which the tax is imposed, shall not be liable to assessment or taxation otherwise.

"For the purposes of the above provision the annual value of the premises in which the business is carried on shall be taken to be an amount representing seven per cent. on the assessed real value of the said premises."

So far as ascertained this provision has not been taken advantage of.

In the cities of Montreal, Quebec and Winnipeg a similar tax is imposed. In the former case the rate is not to exceed $7\frac{1}{2}\%$ on the annual value of the premises as in Ontario.

In Quebec the tax is fixed "at the rate of fifty dollars for every four hundred dollars of the assessed yearly value of the premises," and in Winnipeg the said tax is to be equal to ten per centum of the yearly rental value of the premises occupied at the time of the assessment, subject to certain provisions which are set out at length in dealing with the city of Winnipeg.

It will be observed that the Ontario Act determines the manner in which the annual value of the premises is to be ascertained.

Glasgow (Scotland) also levies a tax on the annual value of premises at the rate of 10% on the rental.

SINGLE TAX.

The "single tax," as is now pretty generally known, aims as its ultimate object, at the nationalization of the land, and the adoption of the single tax is only a mode of accomplishing this object. The leading advocate of this theory is Mr. Henry George, the author of a celebrated book on the subject, entitled "Progress and Poverty."

This gentleman reviews the works of all the leading writers on political economy. In not a few instances he disputes their reasoning and denies their conclusions on many important points. He tells us it is a matter of very little consequence what system of taxation we adopt so long as we permit private ownership in land, which he apparently considers largely responsible for many of the financial evils which afflict mankind. It should here be stated that when Mr. George speaks of "land" he does not include the buildings thereon, as these are the product of industry. This nationalization of land is to be brought about by a tax on land values, so that the owners of the land which will yield a rent will be required to pay the same into the public exchequer, minus a fair allowance for their trouble in collecting it, and by taking the entire annual value of the land Mr. George points out that all other taxes of every sort can be abolished and for this reason he calls it the "single tax."

The advocate of this scheme does not, it would seem, propose to violently interfere with vested interests, but on the other hand he proposes to utilize the machinery at present in use and to which we have grown accustomed, to accomplish what he thinks is so desirable a purpose. He says: "With the current we can glide fast and far, against it it is hard pulling and slow progress." In furtherance of this plan he suggests that one tax after another, whether direct or indirect, should be

abolished and the burden transferred to land. He does not, he assures us, propose to confiscate land for the reason that it is unnecessary; all he proposes is simply to "confiscate rent." Some of his opponents have declared that the confiscation of rent is equivalent to the confiscation of land, and much discussion has taken place on this point. To avoid any misapprehension as to the proposals of Mr. George on this subject, it will perhaps be better to quote somewhat more at length from his writings.

In a chapter of the work already mentioned, entitled "How equal rights to the land may be asserted and secured," we find the following doctrines and methods propounded: "We have weighed," he says, "every objection and seen that neither on the ground of equity or expediency is there anything to deter us from making land common property by confiscating rent. But a question of method remains. How shall we do it? We should satisfy the law of justice; we should meet all economic requirements, by at one stroke abolishing all private titles, declaring all land public property and letting it out to the highest bidders in lots to suit, under such conditions as would sacredly guard the private right to improvements. * * * But such a plan, though perfectly feasible, does not seem to me the best, or rather, I propose to accomplish the same thing in a simpler, easier and quieter way, than that of formally confiscating all the land and formally letting it out to the highest bidders. To do that would involve a needless shock to present customs and habits of thought, which is to be avoided. To do that would involve a needless extension of governmental machinery, which is to be avoided.

"It is," he adds, "an axiom of statesmanship, which the successful founders of tyranny have understood and acted upon—that great changes can best be brought about under old forms. We, who would free men, should heed the same truth. It is the natural method. When nature would make a higher type, she takes a lower one and develops it. This, also, is the law of social growth: let us work by it. With the current we may glide fast and far, against it, it is hard pulling and slow progress.

"I do not," he continues, "propose either to purchase or to confiscate private property in land. The first would be unjust: the second, needless. Let the individuals who now hold it still retain if they want to, possession of what they are pleased to call *their* land. Let them continue to call it *their* land.

"Let them," he says ironically, "buy and sell and bequeath and devise it. We may safely leave them the shell if we take the kernel. *It is not necessary to confiscate land: it is only necessary to confiscate rent.* (The italics are Mr. George's.)

"Nor to take rent for public uses is it necessary that the state should bother with the letting of lands and assume the chances of the favoritism, collusion and corruption that might involve. It is not necessary that any new machinery should be created: the machinery already exists. Instead of extending it, all we have to do is to simplify and reduce it. By leaving to landowners a percentage of rent, which would probably be much less than the cost and loss involved in attempting to rent lands through state agency, and by making use of this existing machinery, we may, without jar or shock, assert the common right to land by taking rent for public uses.

"We already take some rent in taxation. We have only to make some changes in our modes of taxation to take it *all*. * * * In this way the state may become the universal landlord without calling herself so and without assuming a single new function. In form, the ownership of land would remain just as now. No owner of land need be dispossessed, and no restriction need be placed on the amount of land anyone could hold. For, rent being taken by the

state in taxes, land, no matter in whose name it stood, or in what parcels it was held, would be really common property, and every member of the community would participate in the advantage of its ownership.

"Now, insomuch as the taxation of rent, or land values, must necessarily be increased, just as we abolish other taxes, we may put the proposition into practical form by proposing: *To abolish all taxation save that upon land values.*

"As we have seen the value of land is at the beginning of society, nothing; but as society develops by the increase of population and the advance of the arts, it becomes greater and greater.

"In every civilized country, even the newest, the value of the land taken as a whole is sufficient to bear the entire expense of Government.

"In the better developed countries it is much more than sufficient. Hence it will not be enough to merely place all taxes upon the value of land. It will be necessary, where rent exceeds the present governmental revenues, to commensurately increase the amount demanded in taxation and to continue this increase as society progresses and rent advances.

"But this is so natural and easy a matter that it may be considered as involved, or, at least, understood in the proposition to put all taxes on the value of land. That is the first step upon which the practical struggle must be made. When the hare is once caught and killed, cooking him will follow as a matter of course. When the common right to land is so far appreciated that all taxes are abolished, save those which fall upon rent, there is no danger of much more than is necessary to induce them to collect the public revenues being left to individual landholders."

A little further on in the same book, he says: "This simple device of placing all taxes on the value of land would be in effect putting up the land at auction to whoever would pay the highest rent to the state." And again he says: "That to take rent in taxation for public purposes virtually abolishes private ownership in land."*

In the application of this doctrine to the farm lands of the country, one very important consideration presents itself, to which the author of "Progress and Poverty" does not appear to have devoted much attention, and that is the constant tendency of rural populations—especially the sons of farmers—to gravitate towards the large centres of industry, with the result that the cities increase at the expense of the country, which is admittedly an evil. If that is the case now,

*Note.—Although little is said of other proposals, of which Mr. George is the author, it must not be supposed that the "single tax" comprehends his entire plan of social regeneration. In his book, entitled "Social Problems," he, in discussing the question of national debts, employs the following language: "The institution of public debts, like the institution of private property in land, rests upon the preposterous assumption that one generation may bind another generation. If a man were to come to me and say: 'Here is a promissory note which your great-grandfather gave to my great-grandfather and which you will oblige me by paying,' I would laugh at him and tell him that if he wanted to collect his note he had better hunt up the man who made it, that I had nothing to do with my great-grandfather's promises; and if he were to insist upon payment, and to call my attention to the terms of the bond in which my great-grandfather expressly stipulated with his great-grandfather that I should pay him, I would only laugh the more and be the more certain that he was a lunatic. To such a demand anyone of us would reply in effect: 'My great-grandfather was evidently a knave or a joker and your great-grandfather was certainly a fool, which quality you certainly have inherited if you expect me to pay you money because my great-grandfather promised that I should do so.'"

And in dealing with the late civil war in the United States in its relation to the national debt of that country, he says: "As I have before said, the wealth expended in carrying on the war did not come from abroad or from the future, but from the existing wealth in the states under the national flag, and if, when we called on men to die for their country, we had not shrunk from taking, if necessary, nine hundred and nine-nine thousand dollars from every millionaire, we need not have created any debt."

what would happen if we were to take away what now operates as the chief inducement to remain upon the farm, viz., the opportunity of becoming or remaining a land owner?

In the foregoing statement we have given a very brief outline of the single tax in its proposed application to national revenues as set forth by Henry George, and we now come to deal with it in its relation to municipal taxation as advocated by a local organization in Toronto, which asserts that there has been a marvellous growth of public opinion in favor of this method of taxation during the last fifteen years, and that various bodies representing labor are in favor of the principle. A statement has been furnished us purporting to give an account of the numerous agencies at work in this direction, and special reference is made to the work of the "Land Restoration League of England" in this respect.

This organization also calls attention to some recent changes in the assessment laws of British Columbia, Manitoba and elsewhere.

The city of Winnipeg is dealt with under its appropriate heading.

The Assessment Act of Manitoba, provides that: "All lands in rural municipalities *improved for farming or gardening purposes*, shall be assessed at the same value such lands would be assessed at if unimproved."

It should be observed that this is a very partial application of the single tax principle, as it relates only to lands to be used for farming and gardening purposes, and does not affect lands in villages, towns and cities, improvements in which are assessed as they are in Ontario.

The action of the Legislature of Manitoba was probably intended to attract settlers to the vast tracts of agricultural lands now lying idle, rather than to enunciate any particular principle of taxation.

But in the case of British Columbia it is somewhat different. The Assessment Act of that province provides that "*improvements* shall not be estimated for the purpose of assessment in excess of fifty per cent. of their value, and that it shall be lawful for the council of any municipality to pass a by-law either exempting improvements altogether from assessment, or else providing that improvements shall be assessed at a rate less than fifty per cent. of their value."

As this Act was only recently passed, it is too soon to look for results, either in favor of or against the proposition.

Reference is made to a resolution passed in October, 1892, in the Legislature of New South Wales by a vote of 49 to 10, as follows: "That in the opinion of this House a system of raising revenue by the direct taxation of land values, irrespective of improvements, would greatly promote the welfare of this country." A Bill has since been introduced into the House to give effect to this resolution, but it did not pass the Legislative Council.

The colony of Queensland has also, in a very modified form, recognized the principle of single tax on land values by providing for the assessment of improvements separately from the land itself. A distinct portion of the municipal rate is to be levied on land values, but the maximum rate provided by the Act which came into force January 1st, 1891, is so small that it will not relieve improvements from taxation to any extent. A Bill to give to municipal corporations in South Australia, the option of levying their rates upon land values, independent of improvements, has several times passed the Lower House, but the Upper Chamber has always thrown it out.

It will thus be seen that nowhere has the single tax been put into practical operation, even for municipal purposes; it is therefore impossible to point to any facts of importance verified by experience in connection with this subject. Your Commissioners have done all they possibly could to obtain such facts, and that they have not succeeded is fairly good evidence that none exist.

INCIDENCE OF TAXATION.

Much has been said and written on this important question, but no agreement seems to have been reached by those engaged in the discussion of the subject. Many persons, no doubt, consider the matter entirely from the standpoint of their own interest and are disposed to resist any proposition likely to take money out of their pockets, which under some other system might be kept in; and even to those who are sincerely desirous of promoting even-handed justice in the levying of taxes, the greatest difficulties present themselves.

The principle that every man should contribute to the burdens of the country in which he lives in proportion to his ability, is no doubt a sound one, but the question is so interwoven with others which must be considered, that the application of the principle is by no means easy.

Take as an example the capital used in a banking business. It is said that if you tax it as you tax capital used in some other undertakings you will drive it away, and therefore although abstract justice as much requires the assessment of the capital of a bank as the capital of a merchant, still it might be inexpedient to apply the principle in such a case for the reason given. On the other hand, it is maintained by real estate owners and others that it would not have that effect. This, they contend, is shewn by the experience of other countries, and that as the law now stands in the Province of Ontario, the municipal burdens are not equitably distributed.

The subjects of taxation in Ontario are to be found under three heads, as follows: (1) Real property. (2) Personal property, and (3) Income, and with regard to these the law declares that the taxes shall be levied thereon by an equal rate, subject to certain exemptions, a list of which is appended hereto. Little or no complaint is made with respect to the income tax. It seems to be generally conceded that a man who enjoys an annual income of more than $700, can afford to pay a reasonable tax upon the excess over and above that sum, and your Commissioners have received no formal complaint with regard to this tax. But as between real and personal property the most divergent views prevail, and every phase of the question has demanded much attention. We have received very strong representations, both from individuals and organizations speaking on behalf of these conflicting interests. A summary of these different views on this question will not be out of place here. A local organization in Toronto, representing the landed interests, and desirous of transferring a share of the taxation now borne by real estate to some other form of property, proceeds to lay a foundation for the doctrines it advances by declaring that "nearly all responsible Governments are gradually recognizing the importance of encouraging small holdings of land, believing that the people who become directly interested in a home of their own, are the most contented and law-abiding citizens." And we are told that the best way of accomplishing this desirable result, "would be the reduction of the burden of holding said property, in the shape of taxes, to the lowest possible point consistent with efficient government," and that this in turn should be secured, 1st by "economical administration," and 2nd "by compelling every owner of wealth in whatever form it exists, to pay his equitable share of taxes in proportion to the amount of such wealth in his possession, and doing away with all exemptions." This organization is entirely opposed to the principle of assessing only the dividends or income arising from investments in bank stocks and loan companies, while merchants' stocks and real estate are assessed on their "present cash value." This provision in the law, they argue, is particularly unjust to landowners in view of the fact that "they are further liable to pay for local improvements."

By way of contrast we may look at the statements of those who represent the commercial interests and who assert that: "The active capital employed in manufactures and commerce is unjustly and unfairly treated in Ontario." This capital it is pointed out "is taxable on its face value, irrespective of whether it yields profit or loss, whereas some other capital, such as bank stock and shares in loan companies, is only taxed on the income or profit derived from investments, and if it does not yield profit or interest it is not taxed," while a good deal we are told illegally escapes taxation altogether. It is further asserted that under some circumstances the capital used in commerce and manufactures may be taxed twice on its face value, and the following illustration is given in support of this contention:

"A manufacturer owning his premises, assessed for say $10,000, borrows $8,000 on the security of these premises and invests the same in business, he is at once assessed on $18,000, although his total wealth amounts only to $10,000."

Several other examples are suggested, and the case is mentioned of certain wholesale hardware merchants in Hamilton, who recently dissolved partnership on a basis of $150,000 to each partner. One of these partners is said to have invested his share so as to be liable to taxation only on the interest of his money, $10,000, while the other was assessed on $150,000. It is argued that such a result does not encourage enterprise.

It is further said that a large proportion of the capital on deposit in the various chartered banks and savings' banks of the province, amounting to many millions of dollars is not taxed at all. It is freely admitted by some of those who make this allegation, that it would not be just to tax the money so deposited for the very obvious reason, that such a tax would swallow up one-half of the entire revenue derived therefrom; (the interest allowed by the banks for money on deposit being only from 3 to 4 per cent.) and that therefore only the *interest* of money so deposited should be assessed.

It is also found that both the representatives of real estate and the wholesale mercantile trade oppose, but for different reasons, the provision in the law which exempts from taxation, "so much of the personal property of any person as is equal to the just debts owed by him on account of such property."

It is alleged by the real estate holders that fraud on an extensive scale is constantly practised under cover of pretended indebtedness, while the mercantile men assert that even when the law is honestly and fairly enforced it works inequitably, by allowing in certain cases the capital of the foreign merchant to escape taxation, while his less fortunate rival whose chief place of business is in Canada is heavily taxed.

In this connection a correspondent asserts that we have in Canada a large number of what are known as "supply" accounts largely controlled by Glasgow merchants, who for the most part, reap the benefit of the business done by those whom they "supply." The representative in Ontario tells the assessor, that he owes for the whole of the stock in Glasgow, and if necessary verifies this statement in writing, and as a result escapes taxation. The writer of the letter from which these statements are taken asserts that "this province from Sarnia to Cornwall is covered with these 'support' or 'supply' accounts of old country houses."

It is suggested that in lieu of taxing the capital or stock of merchants, either the English system of an income tax or else a business tax, based on the yearly value of the premises occupied by the party assessed should be adopted.

This question of the taxation of personalty has been dealt with in the reports of the Commissioners appointed in several states of the union.

Let us quote again from the report of the Maryland Tax Commission. In

this case a minority as well as a majority report was presented, the former being signed by the well known writer on economic subjects, Dr. R. T. Ely, author of a work on "taxation," while the other received the approval of his three colleagues. Dr. Ely is opposed to the direct taxation of personal property, and for reasons which hereafter appear. The majority on the other hand, are in favor of it, because in the first place, it is in accordance with the constitution of the state, and apart from that they say: "It can hardly be proper for the state to abandon the taxation of personal property, because some of its citizens threaten to commit perjury rather than assume a portion of the public burdens, which their fellows are bearing," and they express the opinion that no other system has been tried sufficiently to justify the adoption of any new basis of taxation in the commonwealth of Maryland.

Dr. Ely says, "Our present system of state and local taxation is unsatisfactory. This is recognized universally, and it is on this account that the present Commission was appointed. The existing method of assessing and taxing property was better adapted to the first half of the nineteenth century than to the second half, for property could then generally be found. The reason why our present system of taxation does not operate satisfactorily can be stated in a word, although it is on the face of it fair and simple, it is found in practice to be an impracticable theory. *A large portion of property escapes taxation.* Taxpayers," he says, "may be divided into two classes. One class constantly schemes to shift off on a neighbor some burden which they themselves ought to carry; the other class, unskilled in the practices of evasion, submit to whatever is measured out to them by the recognized authorities and pay whatever is demanded. The one class is shrewd, enterprising and adroit; the other is content to accumulate property slowly, honestly and by hard labor. It is," he adds, "a primary principle that the subjects of a state ought to contribute toward the support of the government, as nearly as possible, in proportion to their respective abilities," and then proceeds to show that the reverse is sometimes the case.

Dr. Ely points out the distinction between what he considers the proper subject matter for state and municipal taxation, and he reaches the conclusion that for municipal purposes, the basis of taxation should be real estate, which is practically the English system, and he also adopts the co-relative proposition that for state purposes real estate should be exempt from taxation.

Turning now to the reports in the State of New York, we find the same complaint is made that personalty does not bear its fair share of taxation. The governor of the state in his annual message in 1886, says: "It is believed that the tax laws of the state need a thorough revision. The present system of taxation has existed for years with few changes and comparatively little improvement. Every radical modification seems to have been stoutly resisted irrespective of its methods and propriety. "It is evident," he says, "that the personal property of the state does not pay its just proportion of taxes, and the disparity in the assessed valuation of personal and real property, verifies the statement that the statutes governing the appraisement and assessment of personal property are to a great extent defective and do not reach the great bulk of personalty for the purposes of taxation. For years the state assessors have directed public attention to the fact that the personalty of the tax payers was escaping assessment, yet there has been a shrinkage from 1871 to 1884 (not inclusive) of $107,184,371.

"The loss has been upon the assessment roll alone, for the personal property of the citizens of the state has greatly augmented during the same period. The wealth of the state has increased with its population and resources, and if

the personal property does not show an increase upon the assessment rolls, it may be accounted for in part by a lax administration of existing laws, but it may mainly be attributed to the defects in the laws themselves.

"That such laws are inoperative to reach personal estate is evident by the mere statement of the fact, that while according to the last report of the state assessors, the assessed valuation of the real estate of the state is $2,669,175,011, the valuation of the personal estate is only $345,418,361, or about one-eighth of the realty." And he adds: "It is reasonable to believe that if your present tax laws were reformed and placed upon some true and consistent theory, the assessment of the personalty would nearly equal the assessment of the realty and thereby the present unjust burdens upon real estate would be greatly alleviated."

In Massachusetts and Ohio, they reach a somewhat larger proportion of personal property than in New York State, but complaints appear to be everywhere made, that personal property does not bear its fair share of the public burdens.

Under these circumstances your Commissioners being desirous of ascertaining whether or not the representations repeatedly made by the assessors of New York State, as well as by the Governor, with regard to the tax on personal property, had produced, or were likely to produce any tangible result, placed themselves in communication with an officer of the state Legislature and learned from him that, for months past there has been sitting a committee of the Legislature, for the purpose of investigating the entire subject of taxation, the report of which is not yet ready. There appears to be a strong probability that some important changes will be made in the mode of taxation in that state, particularly in the method adopted in raising state taxes.

The history of one state in this matter is practically the history of all, and it would therefore appear to be useless to increase the length of this report by referring in detail to other states of the union.

In dealing with this subject two courses have been proposed, one is to exempt personal property in every form from taxation for municipal purposes and place the whole burden on real estate, and the other proposition is that while adhering to the principle of compelling personal property to contribute its fair quota to municipal taxation, the law be so amended as to ensure that this shall be effectually done. How best to accomplish this result is a problem of great magnitude, which perhaps nothing but experience will effectually solve.

An important branch of this subject is the taxation of incorporated companies. A very considerable amount of literature is available on this subject, but it is necessarily to a large degree theoretical; for instance Professor Seligman in his work on "The Taxation of Corporations," mentions no less than thirteen bases upon which this tax might be levied. The following among the rest—the value of the property. The cost of the property. Capital stock at par value Capital stock at market value. Capital stock plus bonded debt. Gross earnings. Dividends. Net earnings and Franchise.

To evolve satisfactory conclusions from each of the foregoing would appear to be well nigh impossible, and to attempt to deal with these several propositions in this report would hardly be profitable.

The principle applicable to individuals should be applicable to corporations in this matter and that principle is that they should be required to pay according to their ability. Some simple plan of accomplishing this result might perhaps be devised, although it must be confessed that the entire subject of taxation is one of much difficulty.

EXEMPTIONS.

The question of exemptions from taxation is one of great importance, and in considering it, it will be convenient for the purposes of reference to append a list of the exemptions in the Province of Ontario which are as follows:

"1. All property vested in, or held by Her Majesty, or vested in any public body or body corporate, officer or person in trust for Her Majesty, or for the public uses of the Province, and also all property vested in or held by Her Majesty, or any other person or body corporate, in trust for, or for the use of any tribe or body of Indians, and either unoccupied or occupied by some person in an official capacity.

"2. Where any property mentioned in the preceding clause is occupied by any person otherwise than in an official capacity, the occupant shall be assessed in respect thereof, but the property itself shall not be liable.

"3. Every place of worship, and land used in connection therewith, churchyard or burying ground. Provided however that land on which a place of worship is erected, and land used in connection with a place of worship, shall be liable to be assessed in the same way and to the same extent as other land, for local improvements, hereafter made or to be made.

"4. The buildings and grounds of and attached to every university, college, high school, or other incorporated seminary of learning, whether vested in a trustee or otherwise, so long as such buildings and grounds are actually used and occupied by such institution, or if unoccupied, but not if otherwise occupied. Provided however that the buildings and grounds of and attached to a university, college or other incorporated seminary of learning, whether vested in a trustee or otherwise, shall be liable to be assessed in the same manner and to the same extent as other land is assessed for local improvements hereafter made or to be made. This proviso does not apply to schools which are maintained in whole or in part by a legislative grant or school tax.

"5. Every public school house, town or city or township hall, court house, jail, house of correction, lock-up house and public hospital, with the land attached thereto, and the personal property belonging to each of them.

"6. Every public road and way or public square.

"7. The property belonging to any county or local municipality, whether occupied for the purposes thereof or unoccupied; but not when occupied by any person as tenant or lessee, or otherwise than as a servant or officer of the corporation for the purposes thereof.

"8. The Provincial Penitentiary, the Central Prison and the Provincial Reformatory, and the land attached thereto.

"9. Every industrial farm, poor-house, alms' house, orphan asylum, house of industry, and lunatic asylum, and every house belonging to a company for the reformation of offenders, and the real and personal property belonging to or connected with the same.

"10. The property of every public library, mechanics' institute and other public, literary or scientific institution, and of every agricultural or horticultural society, if actually occupied by such society. And all the lands and buildings of every company formed under the provisions of the Act respecting joint stock companies for the erection of exhibition buildings, where the council of the corporation in which such lands and buildings are situated consents to such exemption.

"11. The personal property and official income of the Governor-General of the Dominion of Canada, and the official income of the Lieutenant-Governor of this Province.

"12. The houses and premises of any officers, non-commissioned officers and privates of Her Majesty's regular Army or Navy in actual service, while occupied by them, and not exceeding $2,000 in value, and the full or half-pay of any one in either of such services; and any pension, salary, gratuity or stipend derived by any person from Her Majesty's Imperial Treasury, and the personal property of any person in such naval or military services, on full pay, or otherwise in actual service.

"13. All pensions of $200 a year and under payable out of the public moneys of the Dominion of Canada, or of this Province.

"14. All grain, cereals, flour, live or dead stock, the produce of the farm or field, in store or warehouse, and at any time owned or held by or in the possession of any person in any municipality, such person not being the producer thereof, and being so held, owned or possessed solely for the *bona fide* purpose of being conveyed by water or railway for shipment or sale at some other place.

"14*a*. All horses, cattle, sheep and swine, which are owned and held by any owner, or tenant of any farm, and when such owner or tenant is carrying on the general business of farming or grazing.

"15. The income of a farmer derived from his farm, and the income of merchants, mechanics, or other persons derived from capital liable to assessment.

"16. So much of the personal property of any person as is invested in mortgage upon land, or is due to him on account of the sale of land, the fee or freehold of which is vested in him, or is invested in the debentures of the Dominion of Canada or of this province, or of any municipal corporation thereof, and such debentures.

"17. The shares held by any person in the capital stock of any incorporated or chartered bank doing business in this Province; but any interest, dividends or income derived from any such shares held by any person resident in this province shall be deemed to come within and to be liable to assessment under section 31 of this Act.

"18. The stock held by any person in any incorporated company, whose personal estate is liable to assessment in this province.

"19. The stock held by any person in any railroad company, the shares in building societies, and so much of the personal property of any person as is invested in any company incorporated for the purpose of lending money on the security of real estate; but the interest and dividends derived from shares in such building societies, or from investments in such companies as aforesaid, shall be liable to be assessed.

"20. All personal property which is owned out of this province, except as hereinafter provided.

"21. So much of the personal property of any person as is equal to the just debts owed by him on account of such property, except such debts as are secured by mortgage upon his real estate, or are unpaid on account of the purchase money therefor.

"22. The net personal property of any person; provided the same is under $100 in value.

"23. The annual income of any person derived from his personal earnings to the amount of $700.

"24. The annual income of any person to the amount of $400 derived from any source other than personal earnings.

"24*a*. Provided, nevertheless, that no person shall be exempted for or in respect of income for a sum greater than $700, whether derived from personal earnings or from other sources of income, or from the two combined.

"26. Rental or other income derived from real estate, except interest on mortgages.

"27. Household effects of whatever kind, books and wearing apparel.

"28. Vessel property of the following description, namely: Steamboats, sailing vessels, tow barges and tugs; but the income earned by or derived through, or from any such property shall be liable to be assessed. 55 V. c. 48., s. 7.

"29. The stock or shares held by any person in any toll-road, and the dividends or income derivable therefrom are also exempted from assessment. 55 V. c. 48, s. 29c.

"30. The personal property of a bank, or of a company, which invests the whole or the principal part of its means in gas-works, water-works, plank or gravel roads, railway and tramroads, harbours or other works requiring the investment of the whole or principal part of its means in real estate, is exempt from assessment, but the shareholders are liable to be assessed on the income derived from such companies. 55 V. c. 48, s. 34 (2)."

PARTIAL EXEMPTIONS IN ONTARIO.

In any town or incorporated village in which there are lands held and used as farm lands only, and in blocks of not less than five acres by any one person, such lands shall be assessed as farm lands; but when such lands are not benefited to as great an extent by the expenditure of moneys for and on account of public improvements of the character hereinafter mentioned in the municipality as other land therein generally, the council of such town or incorporated village shall annually, at least two months before striking the rate of taxation for the year, pass a by-law declaring what part or parts of the said lands so held and used as farm lands only, shall be exempt or partly exempt from taxation for the expenditure of the municipality incurred for water-works, the making of sidewalks, the construction of sewers or the lighting and watering of the streets, regard being had in determining such exemption to any advantage, direct or indirect, to such lands arising from such improvements. Provided, however, that such lands are not to be relieved or exempted from the general rate for the payment of any debenture debt contracted before the passing of the Act or that may be renewed in whole or in part. 55 V. c. 48, s. 7*a* (1-2.)

In estimating the value of mineral lands, such lands and the buildings thereon shall be valued and estimated at the value of other lands in the neighborhood for agricultural purposes, but the income derived from any mine or mineral work shall be subject to taxation in the same manner as other incomes under the Act. 55 V. c. 48, s. 26 (1.)

In assessing vacant ground, or ground used as a farm, garden, or nursery, and not in immediate demand for building purposes, in cities, towns, or villages, whether incorporated or not, the value of such vacant or other ground shall be that at which sales of it can be freely made, and where no sales can be reasonably expected during the current year, (in case the council so directs) the assessors shall, in cities, and, where the extent of such ground exceeds ten acres, in towns and incorporated villages, value such land as though it was held for farming or gardening purposes, with such percentage added thereto as the situation of the land reasonably calls for, and such vacant land, though surveyed into building lots, if unsold as such, may be entered on the assessment roll as so many acres of the original block or lot, describing the same by the description of the block, or by the number of the lot and concession of the township in which the same is situated, as the case may be.

In such case, the number and description of each lot, comprising each such

block, shall be inserted in the assessment roll; and each lot shall be liable for a proportionate share as to value, and the amount of the taxes, if the property is sold for arrears of taxes. 55 V. c, 48, s. 27 (1-2.)

When ground is not held for the purpose of sale, but *bona fide* enclosed and used in connection with a residence or building as a paddock, park, lawn, garden or pleasure ground, it shall be assessed therewith, at a valuation which, at six per centum, would yield a sum equal to the annual rental which, in the judgment of the assessors, it is fairly and reasonably worth for the purposes for which it is used, reference being always had to its position and local advantages, unless by by-law the council requires the same to be assessed like other ground. 55 V. c. 48, s. 28 (1.)

EXEMPTIONS ELSEWHERE.

It would be a waste of time to recite in detail the list of exemptions in every case, as there is a striking resemblance between the exemptions in Ontario and elsewhere on this continent, especially in those states of the union which lie contiguous to our own territory.

It is therefore proposed, as the best method of dealing with this question, to draw attention only to material points of difference in a few states of the union and the provinces of this Dominion, giving the reference to the statute in each case.

It should, however, be stated that with regard to chartered banks and some other incorporated institutions, the almost invariable rule in the United States is to tax the capital stock, and not merely the interest or dividends as in Ontario, and to collect the same at the source rather than from the individual shareholders. It should also be stated that with the exception of four or five states there is no income tax in the United States, and consequently no exemption under that head.

Massachusetts is one of the exceptions to this rule. Bearing these facts in mind the chief differences between our own assessment law, respecting exemptions and the laws of the several states and provinces hereafter mentioned, will be found to be as follows:

MAINE.

In this state household furniture is only exempt to the extent of $200 to any one family. Mules, horses, cattle, swine and sheep are only exempt when they are less than 6 months old. "Mines of gold and silver, or of the baser metals when opened and in process of development are exempt from taxation for ten years from the time of such opening; but this exemption does not affect the taxation of the lands or the surface improvements of the same, at the same rate of valuation as similar lands and buildings in the vicinity." (R. S. Maine, 1883, chap. 6.)

OHIO.

In this state there is no exemption for household furniture, and personal property belonging to an individual is only exempt up to $50. (*See* R. S. Ohio, 1890, Title XIII., Chap. 1.)

MASSACHUSETTS.

Household furniture up to the value of $1,000 is exempt, and tools of a mechanic up to $300. The property to the amount of $500 of a widow or unmarried woman above the age of 21 years, and of every person over 75 years (provided their whole estate does not exceed $1,000) is exempt. Mules, horses and cattle less than one year old, and swine and sheep less than six months old are exempt. Incomes up to $2,000 are also exempt. (Statutes of Massachusetts, 1882, Title III., Chap. II.)

CONNECTICUT.

There is a special exemption from taxation in this state of the estate of persons, who, owing to blindness are unable by their labor to support themselves and families. The other exemptions are for the most part similar to those in Ontario, differing only in degree; household furniture is exempt to the value of $500, and parsonages to the extent of $5,000. (Statutes of Connecticut, 1888, Title LXXVI., Chap. 241.)

PROVINCE OF QUEBEC.

The exemptions in Quebec are much less numerous than in Ontario and are comprised under seven heads.

Property belonging to Her Majesty.

Property owned by the Federal or Provincial Government.

Property belonging to *Fabriques*, or to religious, charitable, or educational institutions.

Burial grounds, bishops' palaces, parsonage houses and their dependencies.

All property belonging to iron or wooden railway companies for 20 years under certain conditions.

All educational institutions receiving no grant from municipality.

Property belonging to agricultural and horticultural societies and used for exhibition purposes. Salaries of certain persons are not to be taxed unless the same exceeds $400. (*See* Municipal Code of Quebec, ss. 710, 712.)

BRITISH COLUMBIA.

The list of exemptions in British Columbia, although somewhat shorter is largely a counterpart of the law of Ontario in this respect, and in many of the clauses the language employed is identical; but incomes under $1,500 are exempt, and so are "moneys *bona fide* invested in gold mines." Improvements on real estate are exempt from taxation up to 50 of their value (Statutes of British Columbia, 1888, Vol. 1, Chap. III., 54 V., c. 45 and 55 V., c. 33, ss. 148-9.)

MANITOBA.

What has been said with respect to the law of exemptions in British Columbia, being largely a counterpart of the Ontario law applies also to Manitoba. It should, however, be mentioned that live stock and farming implements belonging to *bona fide* owners, tenants or occupants of real estate of at least forty acres in extent are exempt from taxation to the value of $1,500, together with "all buildings used in connection with a creamery or a cheese factory, and all the machinery used in connection with the said industries, and the land actually occupied by the said buildings, not to exceed one acre in area." (See R. S. Manitoba, 1891, Vol. 2 Chap. 101, s. 3; 55 V., c. 26, and 56 V. c. 24.)

NEW BRUNSWICK.

The exemptions in New Brunswick are few in number and are as follows: The property of the Crown, parish or county; property belonging to common school districts, cemeteries; property of agricultural societies, literary or charitable institutions, household furniture in use, mechanics' tools and fishermen's nets and boats to $200, implements belonging to a farmer, pensions and incomes to the extent of $200, the property to the amount of $500 of a widow or unmarried female, or wife deserted by her husband and compelled to earn her own living and property specially exempted by any Act of the Assembly. (See Con. Stat. of N. B., 1877, C. 100.*

NOVA SCOTIA.

There is nothing requiring special notice in the list of exemptions from taxation in Nova Scotia. (See Statutes of Nova Scotia, 1888, Chap. 2, s. 6.)

*NOTE.—Your Commissioners were unable to find any authority in the statutes of New Brunswick for exempting church property. This led to enquiry, and in a communication from the author of a recently published index of the statutes of New Brunswick, it is stated "no church property is by law exempt from taxation in this province, (N. B.) except in St. John, which is governed by a special charter, 'but,' our correspondent adds, 'by a sort of common consent, church property, that is, church buildings, furniture, parsonages, etc., are *not taxed*.'"

J. R. CARTWRIGHT,
T. W. ANGLIN,
E. SAUNDERS.

SUPPLEMENT.

SUPPLEMENT.

BY

HON. T. W. ANGLIN.

Although the statements and returns which we have been able to obtain especially in regard to municipal taxation in the several countries of continental Europe, are not as full or as recent as could be desired, yet, taken with the statements obtained from several of the United States and from many parts of Canada, they are sufficient to show the chief differences in the systems and in the incidence of taxation. In England, Scotland and Ireland all the municipal revenue required, in addition to that furnished by rents, dues, fees, tolls and fines, was raised by the taxation of real property until the system of subventions from the Imperial Treasury in aid of the local rates was introduced. The amount yielded by the duties and parts of duties transferred to the local authorities, in lieu of those subventions (see pp. 1 and 12), is little more than one-fifth of what is still raised by the rates on real property. In France, Prussia and other countries the amount required for municipal purposes, in addition to what is obtained from the octroi duties where these duties are still levied and from the ordinary sources of municipal income, is obtained by the taxation of real property. The direct taxation of personal property and the poll tax have long been unknown in any part of Europe except the Swiss cantons. Even Russia has given up the poll tax, which, at one time it is said, yielded a large revenue. Incomes are still taxed for municipal as well as for State purposes in Switzerland, and in some cities of Germany.

The United States endeavor to raise a large part of their State (not national) and municipal revenues by the direct taxation of personal property, by special taxes on various occupations in many cases, and (in five or six States) by the taxation of income. Some States in their constitutions prohibit the imposition of a poll tax, as barbarous and degrading; but in the great majority a poll tax is levied, although in some the proceeds are expressly devoted to educational or charitable purposes.

The Provinces of Canada seem to have borrowed their ideas and system largely from the U. States. In Ontario the law makes all real property and personal property of certain descriptions liable to taxation for municipal purposes at its full value. But those holding stocks of banks, of railway companies, of building societies and companies incorporated for the purpose of lending money on the security of real estate, are taxed only on the dividends they receive, and mortgagees pay only on the interest they receive. Incomes are taxed, subject to certain exemptions; municipalities are authorized to abolish the statute labour tax which is, in any case, imposed only on those who pay no other tax. In other Provinces the law provides that all property shall be taxed alike. Which is the better system? Or is either system precisely what it should be?

Real Property.

Land, and the buildings and other improvements on land, have at all times borne a large share of all public burdens. The revenues of the great Roman Republic and Empire were made up chiefly of taxes levied on those who held land as owners in a limited sense and of those who held as tenants of the State or occupants. When the Anglo Saxons became masters of England the *Trinoda Necessitas* or the duty of rendering military service and of building and repairing bridges and fortifications attached to all the land of the kingdom, no matter what the differences in the character of the tenure and no matter what the local burdens were. When the feudal system grew into existence individual ownership of land absolutely disappeared for a time. The sole owner was the sovereign representing the State, and the earls and barons who controlled great tracts of country were but tenants *in capite* bound so to manage the lands entrusted to their charge as to be always prepared to lead the stipulated number of knights and men at arms, properly trained and equipped, on any military expedition ordered by the king, and to maintain them in the field for forty days in each year. When it became necessary for the king to raise money under the name of subsidy or aid or benevolence, rents from lands (paid in addition to the stipulated military service of the sub-tenants) were frequently taxed. This system changed in course of time. The tenants-in-chief and in many cases the sub-tenants became proprietors of the lands, paying a fixed charge which, as money depreciated in value, became in most cases a very small part of the rents themselves received. They did not, however, obtain full relief from feudal duties and obligations until the reign of Charles the Second. Even after that period a land tax was frequently levied for national purposes, and until 1842 the burden of local taxation was borne wholly by real property. Then the landowners succeeded in transferring part of that burden to the general revenue.

The French Revolution relieved the French peasantry from the almost numberless, harassing and oppressive services which they had for ages been compelled to render to the seigneurs and the exactions which scarcely left them food enough even of the coarsest description; but the land is still required to contribute a large share of the public revenue. What is called the Emancipation of the Serfs in Russia was in reality little more than a commutation of the rents which the peasants paid in work, in services of various kinds, in produce and in money, to the great proprietors, and a relief from personal subjection often degrading in character. The price or rent to be paid to the former owners of the land has been found too high in many cases, but the "Mir" or family municipality continues to pay the Imperial land taxes and to furnish its quota of men to the Imperial armies.

Stein and Hardenburg revolutionized the system of land tenure in Prussia, but they made no change in the extent to which the land was required to contribute to the support of the public services, national and local.

Land has always been considered the proper subject for a large proportion of the taxation levied in any way for public purposes. Mr. Goschen, replying in the British Parliament to a gentleman who contended that the land should be relieved from a large share of the taxation it then bore, said :

"I think that if the Hon. Baronet will look to foreign countries or examine the history of his own he will find that at no time has it been held that the taxes upon land are the same as upon other kinds of property." (Mr. Goschen on Local Taxation, p. 183).

In the same debate Mr. Gladstone said : "It (land) is the first subject that offers itself for that purpose (local taxation). That is the tradition of the country

and no one will gratuitously desire to change the arrangement when we consider the adjustment by which real property bears more of local, and personal property more of Imperial taxation." The exemptions which under the British system of taxation real property enjoys, Mr. Gladstone said, "it would not be possible to maintain for a single moment after you remove the exemptions of personal property from local taxation. I do not give an opinion beyond saying," he added, "that if a general proposition is to be laid down that personal and real property are to share in equal proportions the burdens of local taxation, it is impossible to resist the co-relative proposition that real and personal property must be equally charged with respect to Imperial taxation."

The Single Tax Idea.

Some carry the idea that all land is national property so far as to insist that it should bear all the burdens of the State wherever its value is sufficient. This was the idea of the school of Physiocrats who, it is said, largely influenced French legislation in that direction at the time of the great revolution. Others go farther and insist that all the value of the land, no matter how great it becomes, belongs to the State and should be used for State and municipal purposes. Should the fair rents of the lands of the country, urban and rural, exceed the necessary public expenditures the surplus, they contend, should be devoted to other useful public purposes. Adam Smith rather favored the first of these theories. He wrote :

"General rents and the ordinary rents of lands are perhaps the species of revenue which can best bear to have a peculiar tax imposed upon them. Nothing can be more reasonable than that a fund which owes its existence to the good government of the State should be taxed peculiarly. The gains of monopolists, wherever they can be come at, are certainly of all subjects the most proper for taxation." Bastable, a modern writer, regarded as an authority, describes this as "a doctrine, the truth of which as a general statement can hardly be denied. When regarded by itself," he says, "increased wealth seems, as it were, designated to supply the wants of the community, and there is no reason for surprise at the popularity of any proposals in that direction"

J. S. Mill, in his work "Principles of Political Economy, book 5, chap. 2," says: "Suppose that there is a kind of income which constantly tends to increase without any exertion or sacrifice on the part of the owners, those owners constituting a class in the community whom the natural course of things progressively enriches, consistently with complete passiveness on their own part. In such a case it would be no violation of the principles on which private property is grounded if the State should appropriate this increase of wealth or part of it as it arises. This would not properly be taking anything from anybody ; it would merely be applying an accesssion of wealth created by circumstances to the benefit of society, instead of allowing it to become an unearned appendage to the riches of a particular class."

In the same chapter, Mr. Mills says : "In most countries of Europe the right to take by taxation as exigency might require an indefinite portion of the rent of land has never been allowed to slumber. In several parts of the continent the land tax forms a large proportion of the public revenues and has always confessedly been liable to be raised or lowered without reference to other taxes."

But Mr. Mills admits that it would be unjust "to come upon each individual estate and lay hold of the increase which might be found to have taken place in its rental, because there would be no means of distinguishing between an increase owing to the general circumstances of society and one which was the effect of

skill and expenditure on the part of the proprietor. The only admissable mode of procedure would be by a general measure. The first step should be the valuation of all the land in the country. The present value should be exempt from the tax; but after an interval had elapsed during which society had increased in population a rough estimate might be made of the spontaneous increase which had accrued to rent since the valuation was made. From the present date or any subsequent time at which the Legislature may think fit to assist the principle, I see no objection to declaring that the future increment of rent should be liable to special taxation, in doing which all injustice to the landlords would be obviated, if the present market price of their lands was secured to them; since that includes the present value of all future expectations."

THOROLD ROGERS (Political Economy, chap. 22,) says: "In most countries a tax on the rent of land forms a notable item in the revenue receipts. In the United Kingdom it is included in the income tax, the so-called land tax being a rent issuing from the land, invariable, redeemable and wholly disproportionate to the present value of the property from which it is derived."

It may be desirable to try what, under present circumstances, would be the effect of reserving to the State the full, actual, active and permanent ownership of all the land of the nation, assigning for the municipal administrations of cities and towns a sufficient proportion of the rent of the lands within their limits, if any civilized people were in a condition to put aside all old systems and all that has grown out of those systems and to commence *de novo*. But would people, if other countries or cities in which the ownership of land, even though conditional, still existed, were open to them care to settle on farms in which they never could acquire any property except that in unexhausted improvements effected directly by their labor: or to settle in cities in which they could never acquire the ownership of a single lot? What would have been the effect if the people who were invited to settle in the Canadian North west had been told that the increase in the value of the lands, which may be caused by settlement, would never be theirs and that none of them could ever obtain the absolute ownership of a city lot: that their property in the buildings and fences they put up, in the drains they dug, and in such increase in the values of the soil as was the result of labor in reclamation or cultivation would be respected but that of the "unearned increment" in the market price of the land on which they settled, no part would be theirs? Would Winnipeg have grown so rapidly if such a system had been in operation since it was Fort Garry? Would Vancouver be what it is to-day if the State or the C. P. Railway Company had retained the ownership of the land with the right of exacting the full rent as determined by frequent periodical valuations? One of the hopes which inspire the settlers on wilderness lands and sustain them under hardships and privations such as slaves could not endure and live, is that the lands adjoining theirs will soon be taken up and that by this means as well as by their own labor in clearing and fencing and draining a property will be created which they can leave to their children. How many would be induced to take up new lands, how many to remain on the old farms if that hope were taken away?

The principle of dealing with land as the property of the nation and making it bear all, or nearly all, the burdens of government, national and municipal, is very old. It can hardly be said with truth, however, that anywhere or at any time it did so much to promote the welfare and happiness of the people as some imagine it would do now were it worked under the conditions of the present age in the more civilized countries. On this principle eastern countries have been governed from time immemorial. It was the essence of the system of the Roman Empire and of the Germanic and Scandinavian peoples, first

in their original communities and afterwards in those parts of the crumbling empire which they overran; and on this principle the feudal system was established. In the Turkish Empire customs and excise duties were long unknown. The revenue was made up of the amounts exacted from the occupiers of the soil and the outrages which seemed almost to justify the last Turco-Russian war were committed by the "unspeakable Turk," when striving to extort more from the cultivators of the soil than they could pay. In Egypt, under English management, as before, the fellahs who till the soil pay the principal part of what may be called their rents to the government officials. In India, before the British took possession of it, the Ryots paid rent to the native princes, generally one-fourth of the total produce of the land, and had no right of property in the soil they cultivated, although they were seldom if ever disturbed. That system of tenure and rent was continued by the British. In great part of Bengal and in some other districts the British authorities, to avoid trouble, made agreements with the Zemindars, appointed to collect the rents, to pay a fixed annual sum computed on the returns of the previous years, retaining for themselves whatever more they could collect. This promises to have an effect like to that produced by the similar arrangement made by Henry the Second of England, and his successors, with some of the feudal tenants-in-chief, and indeed the Zemindars of Bengal are already regarded as, in some respects, landed proprietors. In other districts, however, the rents are still collected and paid over in the old way. The annual revenue of the Indian Government from land is about £20,000,000 sterling. The condition of the people of either Turkey proper, of Egypt or of British India is not very enviable. It may be said that the money taken from the Indian Ryot is all spent in England. But the condition of the masses was not any better under the rule of the native princes, when all the money raised in the country was spent in the country.

Neither has the partial trial of the principle in municipal affairs proved very successful. Many of the English boroughs own a considerable portion of the soil within their limits, but the revenue they derive from this source is, in most cases, comparatively small, building lots and lands having been leased at low rents and for long terms to persons who had influence with the borough governments. Liverpool (England) for instance, owns property worth £600,000 a year, but the municipality gets only £100,000 a year from it. In many cases the rent received bears even a smaller proportion than this to the present value of the property. It may be said that any such malversation of public revenues would be impossible under the system now proposed, as no leases would be given, and all lands would be valued frequently. But, especially in cities and towns where, as must be the case under this system—as indeed is largely the case now in the cities and towns of the U. States and Canada—the houseowners form a large and active, because interested, portion of the constituency means of escaping from the full burden of taxation—equivalent to the annual value of the lots on which the houses stand—would probably be found.

In France about ten million acres of land are still in possession of the nation and of the municipalities. The management of the forests by the national government is not much complained of. But the management of the three or four million acres owned by the communes and villages is so bad, the produce of this land, much of which is naturally very fertile is so insignificant, compared to that of the lands owned by those who cultivate them, that some writers declare that this communal land is almost wholly lost to the country and its compulsory sale in small parcels has been frequently suggested.

The English Enclosure Acts, the first of which were passed in the sixteenth century, formed a large part of the legislation of that country, even as late as

the reign of George the third. They were essentially unjust, as they deprived a large part of the people of the rights in certain arable lands or in the common or waste lands which they had enjoyed for centuries, without compensation, and gave to the large land proprietors absolute ownership of many million acres of land in which they previously had but a limited interest. But even those who regard these as acts of robbery, as a plundering, under form of law of the weak and the helpless, admit that agriculture could never have even approached its present state of perfection in England if individual ownership had not in some way been substituted for the ownership or occupation in common, which rendered improvement and progress almost impossible.

However the exclusive ownership of large tracts of land in the old world may have been originally obtained, the great majority of mankind agree that the property in land which has been created and sanctioned by the laws and the usages of ages and by the acquiescence of the whole people should be respected so far at least as it is not inconsistent with the existence or the well-being of the nation. Even of those who think that ownership of land is not and cannot be absolute, and that its abuse should be prevented by law, very many believe that to destroy without compensation, the property in land which usage and law have created would be unjust. Others say that if the possibility of acquiring landed property which at all times has been one of the chief incentives to individual effort, were wholly taken away people generally would not be as industrious, energetic, enterprising, thrifty and progressive as they are now.

Neither in Canada nor in the United States can the titles of private land-owners be impugned on the grounds that they or those from whom they derive their titles obtained their lands by force or fraud. In the early days of this Province complaint was frequently made that members of the Government improperly obtained grants of large tracts of land for themselves and their relatives. The total quantity about which such complaints were made was small compared to the area of the whole Province, and all the rest was thrown open to settlers at low prices or without price where conditions of settlement were imposed. Population was the great want of a wilderness region. Without population progress of any kind was impossible and land must remain worthless. The settlers who, having paid the price or done the work required and fulfilled the conditions prescribed, obtained their grants or patents, believed that they had acquired an absolute, complete, indefeasible title to the lands so conveyed to them. The acquisition of land in this way, even the advocates of the single tax system can scarcely venture to call robbery: but even the titles so obtained they contend are of no value, because the natural law forbids the absolute ownership of land and because the people of one generation are not bound by what the people of a previous generation chose to do, even though that was done in the public interest and with the unanimous approval of the whole nation. The contracts, undertakings, obligations, agreements or laws of one generation they allege are not binding upon the next, and nothing done in the past by individuals, peoples or governments can deprive or ought to deprive the people now living of the full ownership and absolute control of all the lands of the world.

Personal Property.

The propriety and the wisdom of raising a revenue for municipal purposes by direct taxation of personal property, occupy much more of the public attention than the advocates of what is called the single tax system have yet been able to obtain for their proposals.

That personal property should bear its full share of national and municipal burdens has never been questioned, but there is still much difference of opinion as to what its proper share is, and still more as to the means by which its proper share can be obtained.

In nearly all the countries of Europe, when personal property which for centuries had been little more than the farm stock, the rude implements and the furniture, scant and more rude, of the occupants of land and the small stock of the traders and others dwelling in the cities multiplied in form and amount it became impossible to reach even the greater part of it for purposes of taxation, and the injustice done to those whose property could be reached became so manifest that the direct taxation of such property was abandoned and other modes of compelling all owners of personal property to bear their share of the public burdens were sought. In England the Probate and Legacy duties. the duty on carriages, horses, servants, armorial bearings, dogs and guns, the income tax and various modifications of the duties of customs and excise were employed for this purpose. In France a tax proportioned to the rental of each house was imposed. This is not a tax on the property, but on the occupant, the rent of the house being regarded as an index of what he should pay on his personal property. This system of levying on personal property has been adopted in the Province of Quebec in respect of the buildings in which business is carried on, and there it is called a business tax. In several countries an income tax is the chief means of reaching personal property.

But in the United States and in Canada the state of things is widely different from that which is found in Great Britain, or in any part of continental Europe. The reasons for imposing the greater part of the public burdens on land do not all exist on this side of the Atlantic. The ownership of land does not confer political power or social privilege. We have no landed aristocracy whose members enjoy vast incomes and aspire to the control of government and legislature. Nearly all our men of large means are residents of cities, who hold in stocks and bonds and mortgages the wealth they have made in commerce or in speculation. The general feeling is that men of this class do not contribute as much as they should to the public service and a chief cause of the complaints which come from all quarters is that very many of them evade the most stringent laws that can be framed to bring their property within the cognizance of the assessor.

Dr. Ely in his work "Taxation in American States and Cities," page 139, says:

"One reason why our present system of taxation was universally introduced may be found in the progress of democratic thought. It was desired that all should contribute in proportion to their abilities. The sentiment all over the union in favor of the taxation of all property is very strong. It is of no avail to talk about abolishing taxes on personal property as some do, unless something is substituted for the personal property tax, so unalterable has become the determination to tax every one in proportion to his ability."

But in the United States as in Europe, it has been found impossible to devise any system by which all or even the greater part of personal property can be reached by taxation. In several of the States, as in Ohio for example, the provisions of the constitution and of the statutes are such as would seem to render it impossible that any considerable amount of personal property should escape; yet much the greater part does escape, as great part has escaped at all times in all wealthy countries in which personal property has been subject to direct taxation. As one writer says: "The rack and scourge of the Romans were as ineffectual as the listing and swearing and other devices which have been so fully tried of late years in the United States.

Dr. Ely admits that, "one uniform tax on all property as an exclusive source of revenue, or the chief source never has worked well in any modern community or State in the entire civilized world, though it has been tried thousands of times, and although all the mental resources of able men have been employed to make it work well." Personal property he elsewhere states "is sometimes discovered in its entirety, but it is then nearly always the property of the comparatively helpless, namely widows and orphans whose possessions are matters of public record."

The testimony on this point comes from all quarters and is perfectly conclusive.

Commissioners appointed by the State of Connecticut to report on the subject of taxation, say, "The proportion of intangible securities to other taxable property has steadily declined from year to year. In 1855 it was nearly ten per cent.; in 1865, it fell to about seven and a half per cent. and in 1875 to about three and three-quarters," yet during those years such property had greatly increased. "Household furniture above $500 in value constitutes an item of only $9,500 in one city," they say, "while a neighboring town of only half the population returned $12,900." "As the law stands," they conclude, "it may be a burden on the consciences of many, but it is a burden on the pockets of few, not because there are few who ought to pay, but because there are few who can be made to pay. A few towns, a few estates, and a few persons of a high sense of honesty bear the entire tax." And they say, "such has been the universal result of such laws elsewhere."

The Commissioners appointed in West Virginia in 1884, say, "At present all taxes from invisible property come from a few conspicuously conscientious citizens, from widows, executors and guardians of the insane and of infants. In fact, it is a rare thing to find a shrewd trader, who gives in (to the assessor) any considerable amount of notes, stocks or money. Paying taxes on this kind of property is considered pretty much in the same light as donations to the neighboring church or Sunday school."

A New Hampshire Commission reported that three-fourths of all personal property in that State is not reached by the assessors.

The New York Commission of which Mr. D. A. Wells was a member, reported at much length on the taxation of personal property, shewing that all the attempts yet made to tax personal property had failed to reach the greater part of such property and that "extraordinary means, whereby such property may be got at, must be the essential features of any system which aims to tax property, that is in great part incorporeal, invisible and intangible." In support of this they quote Gibbon, who in treating of the system of the Roman Empire asserted that "payment of taxes on the secret wealth of commerce and the precarious profits of art and labor can scarcely be extorted by any other means than those of corporal punishment," which was then freely employed by the tax gatherer, and which, it is alleged, "is sometimes freely used for this purpose in some eastern countries in our own day."

To escape from a full taxation of his personal property, the ratepayer of Ohio must make most elaborate mis-statements, commit the most flagrant perjury and expose himself to serious penalties; yet the governor of that State in 1887 in a special message to the Legislature said: "The great majority of the personal property of this State is not returned, but entirely and fraudulently withheld from taxation."

The governor of the State of New York in 1866, said in a message to the

Legislature of that State: "For years the assessors have directed their attention to the fact that the personalty of the taxpayers was escaping assessment and yet there has been a shrinkage from 1871 to 1884 of $107,184,371."

In the City of New York the assessed value of real estate was:—

In 1875	$1,960,352,703
" 1885	2,762,348,218
An increase of	$801,995,515

The assessed value of personal property was:

In 1875	$407,427,339
" 1885	332,383,239
A decrease of	$75,044,160

It is well known that during these ten years personal property had increased enormously in that city, and it is believed that its actual value was twice the value of the real property. According to the assessment the value of the personal property was less than an eighth of the value of the real estate. In Massachusetts, and especially in its principal city, Boston, earnest efforts have always been made to reach personal property and these were at one time so successful that in 1880, the assessed personal property in that little State exceeded the assessed personalty of New York in value by no less than $151,128,018 Yet even in Boston it is found impossible to "get at" all the personal property

The value of real property in that city was:

In 1867	$250,587,700
" 1886	517,503,275
An increase of	267,015,575

The value of personal property was:—

In 1867	$194,358,400
" 1886	193,118,060
A decrease of	1,240,340

In Cincinnati personal property was assessed at $68,412,285 in 1867, and only at $42,571,661 in 1886.

The evidence that in the United States, notwithstanding the stringency of the laws, personal property is "slipping from the assessment," as in 1692 and the years following it slipped from the English assessment, may be multiplied to a great extent.

The taxation of real property in many cases presents the most absurd features. In the efforts of cities and towns to escape from what they regard as an undue share of county taxation, and of cities, towns and counties to escape from an undue or a fair share of state taxation, the valuation is sometimes made ridiculously low; and the county boards of equalization while they do what seems necessary to secure a fair distribution of the county burdens, carefully avoid increasing the total valuation so as to incur liability for more than they believe is their fair share of the State burdens. The valuation of the property in the great city of Chicago affords a remarkable example of the effects of such a struggle.

But, probably little real property escapes taxation, and if all are dealt with alike it matters little whether the assessed value is seventy-five or fifty or twenty-five per cent. of the market value. The fact, with regard to personal property, is that the greater part of it, especially in the large cities, escapes taxation altogether. The exemption of Federal Bonds from taxation; the state of the law which prohibits the imposition of taxation in one State on property liable to taxation in another, or the taxation of property that has already been taxed anywhere; the exemption (in some States) of an amount equal to the owner's indebtedness and the impossibility of ascertaining, unless from himself, what property a man holds in debentures, notes and similar securities afford facilities for escaping from such taxation of which the great majority avail themselves, even in these States in which the rate payers are bound by law to furnish sworn statements of what they own. In New York and some other places, where the ratepayers are not required to assess themselves, the results of what is called a valuation assessment are certainly no better.

In Ontario furniture and "so much of the personal property of any person as is equal to the just debts owed by him on account of such property," are exempt from taxation. In some of the United States, Massachusetts for instance, no deduction is made on account of indebtedness, the ratepayer being treated as owner of all the property of which he is in possession, as if municipal taxation should be apportioned according to benefits conferred. In those States in which deductions are made on account of indebtedness many means of creating artificial indebtedness are employed. This may not be done in the cities of Ontario. It may not be necessary. But if it is true that in England the value of the personal property in cities is three times as great as the value of the real property and that it is at least twice as great in many of the cities of the United States, it certainly should be at least as great in such a city as Toronto. Yet, while in 1892 the real estate of Toronto was valued at $136,584,000, the assessed value of all the personal property was only $10,308,660. Recent exemptions will reduce even this small amount considerably.

Why is it that at all times and in all countries personal property strives, and with such success in most cases, to escape taxation? Besides the universal desire to escape from taxation, is there any special reason?

Railways in several of the United States are taxed on the value of the ground they occupy of the road-bed, ties, rails, rolling stock and buildings, of all that the capital and bonded debt of the roads represent. They are also taxed by several States on their franchise, usually by the exaction of a percentage of the gross receipts. Mines are also liable to municipal and State taxation on their full value, and in some cases are taxed on their output. It is not very surprising, therefore, to find that those who hold stocks and debentures, which but represent the properties thus fully taxed and have no other value, think it unjust that those evidences of wealth should be taxed as if they were essentially wealth, and should employ means even worse than questionable to escape from such taxation.

Many are of opinion that money invested in business and in manufactures with all their risks and uncertainties should not be taxed as much as money invested in real estate, the returns from which are all but certain; and not a few perhaps feel justified on this account in concealing from the assessors as much as they can of their personal property.

It seems beyond question that those who manage municipal affairs sometimes deliberately undervalue personal property through a regard for what they consider the general interest. In the competition for business always so keen even a trifling increase of taxation may produce serious effects. Fawcett says truly

that, "the trade of a district may be seriously imperilled if it has to bear disproportional rates." Some years ago the decennial census showed that the increase of manufacture and of population had been much greater in Pennsylvania than in New York, and this was generally believed to be due to the entire exemption of property invested in commerce and manufactures, from taxation in Pennsylvania. Mayor Hewitt, in a message to the New York city council, in January, 1888, advocated exemption of personalty as a means of building up the business of New York, and stated that the undervaluation of personalty, which had long been cause of complaint was necessary to the business welfare of the city. He said, "Under ordinary circumstances it would have been my duty to remove the Commsssioners complained of (for undervaluation of personal property) from office. But I could not shut my eyes to the fact that the existing laws had never been executed, and there was no difference of opinion amongst those who had studied the question that they never can be executed as they stand in this city." Dr. Ely, one of the Maryland Commissioners, who reported in 1888, says in his minority report (page 187), "Business men of Maryland should understand that there is a deliberate attempt to draw business to New York by low taxation." Even the retail trade of the State, he argued, was seriously affected by the difference in the rates of taxation and "the value of real estate depends upon the condition of business, and unless business flourishes the laboring population can not find employment.

Mortgages.

When capital was very scarce and the rate of interest was very high Upper Canada deliberately adopted the policy which was generally known as free trade in money. Lenders and borrowers were left free to make what bargains they found to their advantage, and municipalities were permitted to tax only the interest received from money lent on mortgage and the dividends of money-lending joint stock companies. The necessity for those means of inducing an inflow of capital probably exists no longer; but capital invested in loans is peculiarly "mobile" and some are of opinion that the very large amount of English capital invested in this Province, through the agency of our joint stock companies, would be "driven out of the country," if, owing to increase of taxation or any other cause, it ceased to yield what the owners consider a satisfactory return. Would this happen if the taxation on real property were apportioned between mortgagor and mortgagee according to the assessed value of the property and the amount of the mortgage as many contend it should be? It is alleged that when money in mortgages is taxed as other personal property no difficulty in borrowing on reasonable terms on good security is found; but it is also alleged that in some of the United States when money invested in mortgages was taxed as other property, such difficulty was actually created. "Would the taxation of money invested in mortgages merely reduce the net income of the lender or would it increase the rate of interest for the borrower?" is a question which has been much discussed. It is an exceedingly difficult question to settle conclusively, so many circumstances affect the rate of interest at different times and in different places. It is a question which even men engaged largely in money transactions would answer differently. The prevailing opinion amongst those who deal with such questions scientifically is that ultimately any tax on money lent must be borne by the borrower.

Mr. D. A. Wells, in the report of the New York commission (pp. 39-40), says:

"All experience shows that in a country like the United States where land

is relatively abundant and cheap, and moneyed capital scarce and dear, whatever interposes between or obstructs the connection of capital and land, works to the detriment of and retards the development of the State."

The law of New York, when that report was written, fixed a maximum legal rate of interest and required that money invested in mortgages should pay the full rate of taxation imposed on other personal property. The effect of this, according to Mr. Wells, was that "capital which formerly found its way into real estate mortgages is now directed into other channels, and to such an extent that was it not for the provisions of law which exempt the mortgage investments of savings' banks and life insurance companies from taxation and compel these institutions to invest a part of their capital in securities, money could now hardly be obtained in New York for the improvement of real estate on the pledge of the property."

In 1860 Connecticut taxed mortgages at their full valuation as other property was taxed, and it was provided that: "As between residents of the State indebtedness might be deducted from valuation, when, at the instance of the debtor, the debt would be transferred for taxation to the list of the assets of the creditor." Two years after it was found desirable to pass a law providing that: "No contract shall be deemed usurious by reason of the borrower's paying or agreeing to pay the taxes assessed and paid on the sum loaned or the insurance upon the estate mortgaged to secure the same." "The practical effect of which," Mr. Wells says, "is most obviously to throw the whole onus of taxation on the debtor and entirely to exempt the creditor."

In New York, Massachusetts and many other States, the law required that mortgages of real estate should be taxed in common with and at the same rate as all other securities and property. New Jersey and Pennsylvania, with what Mr. Wells calls, "a wiser experience entirely exempted mortgages from taxation."

The Maryland Commission of 1888, in their report, pp. 73-4, say that one of the most difficult questions with which they had to deal was the exemption of mortgages. It seemed to them unfair that the holders of a mortgage deriving an income therefrom should not be taxed as the holders of other property were, "but after inquiry, discussion and prolonged reflection" they say: "We have come reluctantly to the conclusion that it is not judicious for us to recommend any change of the existing law on this subject" by which mortgages were exempt. They state that in coming to this conclusion they were influenced solely by a regard for the interests of borrowers. It was their deliberate conclusion, they say (p. 75): "That no method could be devised by which the tax could be collected out of the lender's interest and would not be transferred to the borrower." The Maryland Legislature repeatedly refused to repeal the law exempting mortgages from taxation. Mortgages are now taxed in Pennsylvania.

Dr. Ely, in his minority report, says: "Turning this matter over in my mind and looking at it from every possible standpoint I fail to see how the exemption of mortgages is a special favour conferred on money-lenders. It is an exemption which makes the flow of capital to us easier and the benefits are thus diffused throughout the community." Dr. Ely contends that if mortgages are taxed the tax is paid by the borrower. He says: "A lender in Baltimore is content with good five per cent. mortgages, because he knows that they cannot be taxed. If they were legally taxable as in other States he would want six where he now takes five," even though the tax on mortgages, where imposed by law, is generally evaded. The lender would protect himself against the risk.

Banks.

The feeling that capital invested in banks should bear a full share of all public burdens, is very strong wherever personal property is taxed. The owners

of bank stock are regarded by many as wealthy men who take advantage of the wants of all who must borrow money. And although money invested in bank stock is not always perfectly safe, as is money invested in good mortgages, yet it generally yields a much larger annual return. The feeling that bank capital should be taxed is so strong in some of the United States that more than one State constitution provides that it must be taxed. The Constitution of the State of Ohio, Article XII, says: "Laws shall be passed taxing, by a uniform rule, all moneys, credits, investments in bonds, stocks, joint stock companies or otherwise, and also all real and personal property according to its true value in money;" and again:

"The General Assembly shall provide by-laws for taxing the notes or bills discounted or purchased, moneys loaned and all other property, effects or dues of every description (without deduction) of all banks now existing or hereafter created, so that all property employed in banking shall always bear a burden of taxation equal to that imposed on the property of individuals."

It is not easy to understand how banking could be carried on if this provision were strictly enforced.

The capital stock of domestic banks at par value and so much capital as is employed in the branches of banks whose headquarters are elsewhere, are taxed as other personal property in the cities of the Maritime Provinces.

In Ontario, in accordance with the policy of inducing outside capital to seek investment in the Province, the owners of bank stock are required to pay municipal taxes only on their dividends. This, many who have capital invested in commerce and manufactures, complain of as unfair.

It is alleged that if banks were taxed on their capital, money would not be "driven out of the country," because the profits would still be so large that the stock of every bank of good standing would still sell at a price far above par. It cannot be denied that if the full capital were taxed profits would be reduced precisely to the extent of the increase of taxation unless some means were found to increase those profits. Would such means be used? Would the rates of discount be increased and the interest on deposits be reduced? Would the burden imposed on the stockholders be by them transferred to the customers of the banks? It may be assumed that this would be done if possible, and there is no doubt that an increase in the rate of discounts would affect business men, manufacturers and, indeed, the whole community very seriously. There are some who contend that the rate of discount would not be affected by a fair tax on bank capital: that the rate is not higher in those cities in which bank capital is fully taxed than in the cities in which only dividends are taxed; that the causes which influence the rates of interest and of discount are of so general a character that an increase or diminution of local taxation would have no perceptible effect on them; that no bank has ever been known to reduce its rate of discount merely because its profits were large and that all banks exact the highest rate of interest that a scarcity of money at home or abroad, a disturbance in the rates of exchange or the necessities of their customers enable them to exact.

Mr. Wells, in the report from which we have quoted so frequently, does not discuss this question, but in recommending that all corporations created by the State which are in the nature of a monopoly should be taxed, says: "Other corporations which approximate in character to the gas company would be the national banks (which may be taxed under the present provision of the United States law through their stockholders) and State banks."

Dr. Ellis, in his work (taxation in American States and cities, pp. 331-2), says: "The Maryland system of taxing incorporated banks works well. They are taxed

by the State authority, namely, the State Tax Commission. The actual value of all shares is computed, and from this the assessed value of each share for purposes of taxation. Banks often pay local authorities also and deduct the same from the dividends. The Maryland system requiries all corporations to pay taxes on stocks and bonds and to charge the tax to holders of stocks and bonds. There is everywhere difficulty about the taxation of unincorporated banks, (which) return little or no capital, and the private bankers . . escape the personal property tax by devices already sufficiently elaborated. This is a grievous injustice." Mr. Ely recommends as a remedy that all engaged in banking business should be compelled to become incorporated, but he thinks that "possibly, practical bankers might devise some better plan."

All writers agree that money invested in bank stocks should be taxed at least as heavily as other personal property, unless total or partial exemption of money so invested be manifesty in the public interest. Some contend that because of the value of their franchise, which authorises them to issue paper as money, banks should contribute more to the revenues, national and local, than other descriptions of property.

Loan Companies.

What has been said of banks may be said of loan companies. Unless it be in some way detrimental to borrowers there can be no reason why the owners of the stock of such companies should not be taxed at least as heavily as those who hold stocks of dry goods, hardware or groceries. The only questions to be solved with respect to them are:

Would the full taxation of the capital stock of such companies cause a withdrawal of any considerable portion of the capital now invested in them—"drive money out of the country?" or

Would the companies be able to extort from those who borrow from them such an increase in the rate of interest as would equal in product the increased taxation?

Some assert that these companies also demand in all cases the highest rate of interest which the circumstances of the money market and the necessities of borrowers enable them to exact.

Insurance Companies.

Insurance companies hold a position different from that of either banks or loan companies inasmuch as it is not necessary to invest much capital in their business. The law requires that insurance companies shall have a certain amount of paid-up capital and shall make certain deposits with the government as security to the insured, and those who manage such companies have learned that in order to create public confidence it is desirable to hold available investments to a much greater amount than the law requires. But nearly all the capital held by them is invested in interest-bearing securities, and only as much is kept on hand as is thought absolutely necessary to meet such demands as may arise any day. The premiums received one year with another are more than sufficient to cover all expenses (although the expenses of this business as now conducted are very large) to meet ordinary losses and to pay handsome dividends. It is only when a great fire, such as that of Chicago, Boston or St. John, N.B., occurs, that the receipts of any year are insufficient to meet all demands on the fire insurance companies and leave large profits; and in the case of well-conducted life insurance companies the profits are always large, the amount paid on the death of the insured every year probably not exceeding on the average one-half the amount received as premiums.

Would an increase in the taxation of such companies cause an increase in the rates of insurance or merely diminish the profits of the insurance companies? The policy which encouraged an influx of English and American capital by determining that in respect of money invested in mortgages only the interest should be liable to taxation, and with respect to money invested in banks, that only the dividends should be taxed, led also to the provision that only dividends of insurance companies should be taxed. In 1880 the law was so amended that certain incorporated companies, including insurance companies, were made liable to assessment on their personal property, "in the same manner as if they were unincorporated companies." This amendment is embraced in the Consolidated Assessment Act of 1892. .

Mr. ELY in his work (p 331), says:

"Insurance companies are highly useful institutions, and they are liable to competition. It is impolitic to place any undue burden on them. * * It is better to insist upon stricter business methods on the part of insurance companies and more adequate guarantees that they will fulfil their contracts as a recompense for their franchises, than to lay heavy taxes on them. They should of course be obliged to pay their proper share of taxes." "What that proper share would be, it seems, difficult to determine. Mr. Ely says, that "in their case there is more reason for limiting taxation to a tax on dividends, or net revenue than in the case of other corporations," but he does not give any reason for this opinion. It may be because the rate of insurance would probably thus be kept down and the benefits of insurance would thus be extended to a greater number. But competition as to rates has in most cases ceased. The representatives of the companies doing business in the larger cities generally agree what rates shall be charged, and adopt means to enforce the agreement, which usually prove sufficient. And the rates are generally higher than they need be if the competition in obtaining business and the recklessness in taking risks were not so general. Professor Rudolf Gniess in an article in the *Contemporary Review* of December, 1884, states, that in Berlin there is a municipal fire insurance office, which the houseowners of that city are obliged to join:" that "the value of the buildings insured in this office in 1881-2 was over 2,000 million marks," and that the annual premium was five or six pfennings per 100 marks, or about one cent on every 25 dollars. The rate is so low he says, because the buildings are of a solid character and the fire brigade is excellent. He might have added as another reason that the cost of obtaining business and of management is small. So low a rate no one would regard as possible in our cities under any system.

The modes of taxing insurance companies vary greatly. In some cases they are taxed on their capital, actual or estimated, as in some of the Canadian Provinces; in some places on their gross receipts. In many cases a fixed sum resembling a license duty is collected. The State of Vermont imposes two per cent. on the gross amounts of premiums and assessments collected by insurance companies, whether home or foreign and one-half of one per cent. on all surplus over and above the necessary reserve. The value of the real estate of such companies, which is fixed as other real estate, may be deducted from the surplus before paying the one-half per cent., but not from the gross receipts. The Maryland Commission of 1888, recommended that "a gross receipts tax of one per cent. be imposed upon domestic insurance companies and of one and a half per cent. upon foreign insurance companies in addition to the tax measured by the companies dividend."

Of the law relating to insurance companies as it stood in 1878, and its effects, Mr. Maughan, Assessment Commissioner, in his evidence before a Legislative Committee, said:

"Insurance companies invested their moneys in securities that were unassessable and for that reason he believed they ought to be assessed. The city authorities wished to assess the income of both local and foreign companies, and then there could be no unfair discrimination." That would seem to be fair, but if we understand Mr. Maughan's evidence, neither domestic nor foreign insurance companies paid anything more than the ordinary tax on the buildings in which they did business. He said:

"Toronto appeared to be a fruitful field for insurance companies. There were no less than 75 different offices in the city, and there was not one of that number paying a cent of taxes to the city except on the buildings they occupied, and some of them had not buildings, for the agencies were frequently held by parties carrying on other business."

Mr. Maughan added that the city officials could not get at the amount of the stock of these companies'. The officials of the companies refused to give any information. "They were not there," he said, "in the interests of the city, but in the interests of themselves. He therefore thought they ought to be taxed." He "would put a license on them according to the volume of business they do."

Other Incorporated Companies.

Few railroads in Canada pay even moderately reasonable dividends on the money invested in them and such roads as are projected can not in any case be built without government subsidies and local bonuses. Nobody expects that for many years to come any Canadian railroads can contribute more to public purposes than they now pay under the municipal laws, and as duties on the coal and the other supplies which they must import.

It is now generally agreed that water-works, gas-works, and street railways should be owned by the municipality, or should be under its control, and pay a considerable portion of their gross receipts for the public benefit. Telegraph and telephone companies which are monopolies and occupy the streets to so large an extent, are in many places taxed two or three per cent. on their gross receipts. Express companies, title insurance companies, trust companies and safety deposit companies, are generally regarded as proper objects of special taxation.

In the U. States the State taxes are largely municipal in their character. In 1887, Pennsylvania derived from what may be regarded as proper sources of municipal taxation, nearly the whole of its revenue, imposing no general tax on land. It received in that year from the

Tax on corporation stock	.....	$1,702,057
" gross receipts of corporations	.....	776,388
" stocks of banks, safe deposits and trust co's	..	431,628
" personal property	.....	864,355
" foreign insurance companies	.....	377,571
" net earnings or income of companies	.....	81,597

Licenses of all kinds yielded about $1,200,000. Taxes on wills, deeds and inheritances, a bonus on charters, a tax on the receipts of the Alleghany Valley railroad ($212,500), fees, commissions and other charges, also yielded considerable sums. A commutation of tonnage dues yielded $460,000.

In New York State the taxes on corporations yielded $1,441,528. New Jersey received $778,290 from railroad and canal corporations and $147,415 from what are called miscellaneous corporations.

Massachusetts collected corporation tax $2,227,579; bank tax (savings and national) $2,398,267; insurance co. tax $326,336; insurance licenses $22,923; coal and mining companies' licenses $4,777 and foreign railway tax $22,919. The income from the Hoosac Tunnel was $383,765.

Income.

Income is made up of rents, interest, profits—or dividends—or wages—including in wages the salaries of those in permanent employment and the fees of professional men. In several cases a man's income is derived from two or more of these sources. All taxes that do not diminish capital fall upon income ultimately, no matter how they are levied in the first instance. It would therefore seem that if the amount of all incomes could be ascertained accurately, an income tax properly regulated would be the most fair and just and least oppressive of all taxes. Dr Ely says in his book (p 287): "It is the fairest tax ever devised; it places a heavy burden when and where there is strength to bear it and lightens the load in case of temporary or permanent weakness. Large property does not always imply ability to pay taxes, as taxes should come from income; even when assessed on property, it is only an indirect device for estimating income. An income tax spares the business man in season of distress, and helps him to weather the storm, but asks a return for the consideration shown in days of prosperity." He states that many in receipt of large incomes now escape taxation, and that men of this class take little interest in public affairs and affect to despise politics. An income tax would reach such persons and force them to concern themselves about "practical politics." "It is," he thinks, precisely the kind of a tax needed and it is beyond question that it would change the attitude of a large portion of the community towards the government.

It is generally admitted that an income tax to work fairly, should bear less heavily upon small incomes than upon those that are large, as even a few dollars taken from the income of a poor man, means a diminution of his ability to procure the absolute necessaries of life. This would be a serious objection to the substitution of an income tax for all other taxes were such substitution otherwise possible, as it would be exceedingly difficult to provide for all public services by a tax borne by those alone who possess more than a competency. In Great Britain incomes under £150, are exempt from income tax, and incomes from £150 to £400 pay a lower rate than incomes above £400. In Prussia incomes below £60 are now exempt from income tax. In Switzerland taxes on incomes and personal property have for many years been carefully graded, the rate increasing as the amount of income or value of property increases. This seems to be a just principle, but like all principles is liable to abuse. Adams and Cunningham in their work on the Swiss Confederation, state, that in 1887 the Canton of Vaud passed a law changing the system of taxation, so that nearly the whole burden was thrown on the wealthy, and that in consequence of this, several whose wealth was movable, left the Canton in that and the following year.

The amount of income which should be exempt from taxation according to the advocates of this system of taxing incomes is what they call the "minimum of subsistence." This necessarily varies in different countries. In Ontario it was placed for many years at $400. Now incomes derived from personal earnings are exempt to the amount of $700; and of larger incomes only what remains after the $400 or $700 has been deducted is liable to taxation.

The objections to an income tax, are however, very numerous.

Many contend that precarious incomes derived from personal efforts, or from business in which there is always some risk, should not be taxed as heavily as incomes derived from accumulated wealth in any shape. This principle is the basis of those provisions of the municipal law of Ontario, which exempt from taxation "the annual income of any person derived from his personal earnings to the amount of $700, but exempt only to the extent of $400 income "derived from any source other than personal earnings."

Mr. McCulloch in his time contended that an income tax is essentially unfair, as the amount of a man's income is not always a fair measure of his ability to pay taxes. One man who has a £1,000 a year, he says, and a small family could much more easily pay £100 a year in taxes than another man who, having also an income of £1,000 has a family of ten children to provide for. He thought it would be better to allow every one to adjust his taxation, as well as his other expenditures, to his circumstances. It is also objected that an income tax is inquisitorial in its nature and so strong, especially for this reason, was the objection felt to this tax in Great Britain when it was proposed to re-impose it in 1842, that the government of the day were compelled to give the most solemn assurance that it would be imposed, but for a brief period. It was also objected that it would be unjust in its operation, as it would be impossible to ascertain what were the incomes of those who could conceal the sources of their incomes, or who could make successful misrepresentations as to the profits of the business in which they were engaged; thus the dishonest would to a large extent escape and the honest and those who could not conceal what their incomes were, would bear more than their due share of the public burdens. Many other taxes it was argued on the other hand, are as inquisitorial and none are more essentially just. The promise which the British Government made to discontinue the income tax, was not kept. It has been continued to the present day. It appears to have become permanent. And although much fraud may be practised, the tax is on the whole satisfactorily collected and few complaints are now heard of, the inquisitorial character of the investigations by which the amounts of the incomes of business men and professional men are ascertained.

Dr. Ely, says, "it is incomparably more difficult to assess a personal property tax fairly" and that "wealthy men found the income tax (when it was imposed in the U. States), a less easy tax to evade than the personal property tax and precisely on that account raised a hue and cry against it." Again he says, "any one who is honest must confess that it is easier to discover income than personal property," and "in the income tax we have a tax which is congenial to the spirit of democracy and which tends to become more general as the masses acquire power; a tax which wherever it has been honestly tried, is administered with increasing care and justice and which grows uninterruptedly in popular favor." But it is not suitable to cities, he thinks, because it must there act like the personal property tax and drive people from cities to suburbs." He states that most cities in America are surrounded with a taxpayer's paradise a suburb to which the wealthy resort, in order to escape the payment of taxes in the cities in which they obtain a livelihood. These people would similarly escape their fair share of the income tax." Under our system it would not be difficult to amend the law, so as to reach such people. Mr. Bastable in his work pp. 360-1, says, that to tax a person on his income for the service of the locality in which he resides, is open to the double objection that it is likely to be evaded, and that it is grossly unfair. Local authorities, "he says," have no efficient machinery for detecting concealed income. They are in a worse position than the English officials, in regard to foreign investments where failure is admitted. The mer-

moving from the area for part of the year, would upset the arrangements. Mr. Goschen's view seems conclusive. (It appears to me impossible to devise an equitable local income tax, for you can not localize income. * * No matter how large the local division may be the same objection lies. The American States and the Swiss Cantons are as little suited for the application of separate income taxes as England, Ireland and Scotland.) Owing to the variety of modern incomes and the difficulty of following them to their sources the income tax should always be a general tax."

Only in five of the American States is any attempt made now to collect an income tax and in one of these Massachusetts, incomes under $2,000 are exempt. In Ontario and some other Provinces of Canada, an income tax is imposed to raise revenue for municipal purposes. The results are not wholly satisfactory. The man who occupies a position in which the amount of his incomes is easily ascertained, and who is taxed on the full amount less the $400 or the $700, regards it as a great injustice that he is taxed so highly, while so many others who live as if they had incomes four or five times as great, do not pay as much. In 1892, the amount assessed as incomes in Toronto was $6,060,273, a little less than four per cent. of the whole amount assessed as ratable real estate, personal property and income. As the exemption of $700 relieves all laborers, all or very nearly all mechanics and artizans, a very large number of clerks, salesmen and other employés and probably not a few small shopkeepers from income tax, it seems probable that few of those legally liable to this tax escape from it. That some do escape altogether and that others are assessed on much less than the incomes they seem to spend, those who are assessed on the full amount of their salaries (less the $700), naturally regard as a grievance. Some of those who are taxed on income, no doubt, are of opinion that incomes should not be taxed at all for municipal purposes.

Business Tax.

In France the character of the house in which a man dwells is regarded as on the whole, a fair index of his ability to pay taxes and a tax proportioned to the rental of his dwelling is considered a fair tax on personal property. In Quebec persons who occupy houses for business purposes are taxed on the same principle, according to rental. This mode of taxing personal property recent legislation makes optional in Ontario. It may be doubted whether this business tax, as it is called, works as equitably as the tax on dwellings. Rich men do not often live in small or mean houses; but a retail merchant with a comparatively small stock often pays a higher rent for his shop on one of the great thoroughfares than a wholesale merchant doing five or ten times as much business, pays for his warehouse on a quiet street.

Licenses.

Stores, shops, saloons, taverns and other places in which alcoholic liquors are sold are required to pay a special tax wherever they are permitted to exist. Special taxes are generally imposed also on all occupations and all kinds of business which are thought to require registration and supervision. In some cities special specific taxes are levied, avowedly for revenue purposes, on banks, loan companies, insurance companies and on those engaged in a great variety of occupations. About the policy of raising revenue in this way there must be a great difference of opinion, because while in many cities of the U. States and in the Province of Quebec such taxes are imposed on all occupations to which some privilege is supposed to attach, in a great many cities only those occupations which it is thought necessary to regulate by license pay a special tax of any kind

Exemptions of Property.

Very much has been said and written about the exemptions of certain properties in cities and towns from taxation, and many who feel the burden of taxation particularly grievous imagine that if all exemptions were done away with they would be greatly relieved. This opinion is based largely upon those statements of the assessed values of real property subject to taxation, and of real property exempt from taxation which are published from time to time. According to these statements the value of the properties exempt is from one-eighth to one-sixth of the value of the properties taxed or even more.

An analysis of any of these statements given in detail shows that a very large part of the exempted property belongs to the cities and towns. Parks, gardens, squares, city hall, police court, police stations, fire department stations, market places and buildings, registry offices, school houses, and all other buildings owned and maintained by a city are included in the list of exemptions and form a very large part of the whole. To tax these would be ridiculously absurd and would lead to no other result than a considerable increase in the amount and cost of assessment and of the city book-keeping.

County buildings are generally located in the cities and towns, and in some cases are used conjointly by city and county. The city of Toronto would not gain much by imposing a tax on the court house and gaol and paying the greater part of that tax itself.

Under our system, charitable institutions are not sustained by the municipalities. Some are provincial and to the support of others, the Province and the municipalities contribute. The buildings occupied by such institutions are usually large and the grounds attached are in some cases valuable. We do not know what would be the value for purposes of assessment of the General Hospital, St. Michael's Hospital, the Hospital for Sick Children, the House of Providence, the Home for Incurables, the House of Industry, Houses of Refuge, Reformatory Schools, and the other institutions of this kind in Toronto, but it would be large. To impose a tax upon those institutions would be equivalent to a reduction of the amount contributed to their support by the municipality. The ability of the institutions to do the work which they have undertaken to do—for the public—would be lessened to the extent of such taxation, and few of them now receive from all sources as much as they need. Would it be wise—not to say Christian or humane—to change the law so that a larger amount of poverty and suffering must go unrelieved? Would it not be absurd to tax those institutions according to their value, and at the same time to increase the amounts paid to them by the municipalities so that their resources should not be impaired—as some propose?

Some complain that educational establishments, unconnected with the provincial school system, are exempted from taxation. These institutions do a large and important work which, if it were not done by them, must be done by the municipalities at a cost that would greatly exceed the amount which could be collected as taxes from the properties they occupy. A fair calculation would prove conclusively that because of the existence and the work of these institutions the ratepayers are much relieved. Some do contend, however, that no consideration should be had for those who are not satisfied with the public school system, and that private schools should be discouraged even though the burden of taxation be much increased. Such persons insist that even the university should be taxed on its buildings and lands, because although it is a public institution and largely under the control of the Provincial Government it is not a municipal institution, and many of the students who receive an education there come from other parts of the Province.

Other large portions of exempted property belong to the Dominion and the Provincial Governments. All municipalities desire that the governments should put up buildings within their boundaries, and that those buildings should be ornamental and therefore expensive. Would it be just or politic that such buildings, when erected, should be taxed as buildings used for private purposes Were such a policy followed would not governments erect only the plainest and least expensive buildings? Toronto, desirous of having a handsome legislative building, gave to the Provincial Government a magnificent site free of cost. Would it be right now to tax that building? Ottawa was little more than a lumbering village until it became the seat of the Dominion Government, yet there is much grumbling because the government buildings are exempt from taxation. In Great Britain, for some years past, the government pay a portion of the borough and other rates corresponding, we believe, to the estimated value of the services rendered to national property by the municipalities, and to this no objection is made because it is regarded as an equitable arrangement.

Public libraries, museums, art galleries, and buildings for the use of scientific and literary societies, and of agricultural societies, from which no private profit is derived, are usually exempt from taxation, being regarded as essentially of a public character, even when nominally owned and controlled by private associations or corporations. Even buildings, such as these, some would tax at their full value, unless, perhaps, where they are owned by the municipalities.

Churches, and all other places of religious worship, and the land on which they stand, have always been exempt from taxation, and they are exempt everywhere now except in the State of California. In feudal times bishops, abbots, and other ecclesiastics, were required to render defensive military service to the King for the lands they held as tenants *in capite*; and when subsidies and aids were demanded the clergy as a body contributed a full share. But churches, hospitals, and other buildings devoted to the service of God as places of worship, or charitable institutions, or to educational purposes, never were taxed on the principle that what was directly dedicated to God's work should not be made tributary to the wants of man. This principle operates in all English legislation relating to this subject. An English Act of 1656 exempted, besides churches, hospitals, alms'-houses and educational establishments, all the masters, fellows and scholars of universities and colleges, and the ministers of hospitals, and also the houses and lands belonging to hospitals in respect of rent or revenue payable to them and disbursed for the immediate relief of the poor. For some time after the restoration no account was taken of the churches and chapels of dissenters but an Act, 3 & 4 William 4, chap. 30, provided that all "churches, chapels, meeting-houses and premises duly certified for the performance of religious worship" should be exempt from taxation. The Irish Poor Law Act exempts churches and other buildings exclusively devoted to religious worship or to the education of the poor, burial grounds, infirmaries, hospitals and all buildings used for charitable purposes from taxation for poor law purposes. The law which imposes the income tax in Great Britain exempts from income the lands held in trust for charitable purposes. In other countries of Europe the same principle still prevails. In France, which does not allow even the name of God to appear in its public school books, the churches are treated as public property and are repaired and maintained at the expense of the State.

Those who are not influenced by religious considerations differ as to the propriety of taxing churches. Some contend that if people choose to have fine churches they should pay for them and should not ask the public to contribute directly or indirectly towards the cost of them. It is unjust, they argue, to compel those who do not belong to such churches to pay part of the taxes which

they should bear as taxes are borne by other properties. Others say that it is advantageous to a city to have handsome churches which do much to cultivate artistic tastes and to attract visitors; and beautiful churches may not be built if the congregation must pay, not only the first cost of such beauty but a heavy tax on it ever after. Others argue that as all denominations now strive to build large and beautiful churches, and the people of a city or town nearly all belong to some of the denominations, and nearly all go to church, they all share pretty much alike in the benefit of their exemption from taxation. It is contended on the other hand that if churches were taxed all the members of every congregation would be taxed in proportion to their means and no injustice would be done to any one. It is pretty generally understood, however, that few churches possess or raise a revenue in excess of their urgent needs, that many are in difficulties and that a large proportion of every congregation contributes little for church purposes. A tax on the full value of the church would, in most cases, be felt as a heavy burden, and there is but one denomination, we believe, that objects to exemption. If there are any in the community who belong to no religion, who never go to any place of worship, never allow any member of their families to take part in public religious worship, and who pay rates, such persons may claim to be relieved from the payment of such portion of their taxes as they would not be required to pay if churches were taxed, and their claim should receive due consideration. Except these, however, no one seems to suffer because churches are exempt. Others there are who, viewing this question from what they call the broad grounds of public policy, say that churches should be exempt from taxation as educational institutions should be exempt, because of the service they render to the community. Dr. Ely, in his work, says:

"If it promotes the general welfare to exempt church buildings from taxation it is perfectly proper to do so. There are two questions to be asked: Do churches promote the intellectual, moral and economic interest of the people? Will they be aided in their work by the exemption of the property used purely for religious purposes from taxation? All States except California answer both of these questions in the affirmative."

The amendment of the Ontario Assessment Act, which makes "the land on which a place of worship is erected and land used in connection with a place of worship," and "the buildings and grounds of and attached to a university, college or other incorporated seminary of learning," liable to be assessed in the same manner and to the same extent as other land is assessed for local improvements, reduces very materially the extent to which such lands and buildings are exempt.

The only property in any city or town now wholly exempt from municipal taxation from which, by any change of law, much money could be got for municipal purposes is that belonging to the Dominion Government, that belonging to the Provincial Government, that belonging exclusively to the counties, and that belonging to charitable institutions wholly supported by public benevolence.

T. W. ANGLIN.

RETURN

To an Order of the Legislative Assembly, dated the 12th April, 1893, for a Return of the names of the several purchasers of the Timber Berths disposed of at the sale of October, 1890, and of the Sales, if any, which were not carried out, and of the amounts, if any, remaining unpaid on account of the purchase money, if any, of such lots, and of a copy of the Order-in-Council authorizing the sale and of the advertisement and conditions of sale.

By Command,

J. M. GIBSON,
Secretary.

TORONTO, 4th May, 1893.

RETURN

Called for by Resolution of the House of Assembly, dated the 12th day of April, 1893, of the names of the several purchasers of the Timber Berths disposed of at the sale of October, 1890, and the sales, if any, which were not carried out, and of the amounts, if any, remaining unpaid on account of the purchase money, if any, of such lots, and of a copy of the Order-in-Council authorizing the sale and of the advertisement and conditions of sale.

Names of the several Purchasers of Berths disposed of at the sale of October, 1890.	Sales which were not carried out.	Amounts remaining unpaid on account of Purchase Money.
Robert Thompson.		
George H. Wilks.		
J. L. Murphy.		
W. H. Levett.		
W. Ross.		
L. B. Montgomery.		
H. L. Lovering.		
W. C. Cameron.		
S. F. McKinnon.		
M. H. Ford.		
P. Ryan.		
Sadler, Dundas & Co.		
McArthur Bros.		
	Berth (No. 1) Thunder Bay.	
		$18,201 37

Department of Crown Lands,
Toronto, 4th May, 1893.

AUBREY WHITE,
Assistant Commissioner.

[Copy.]

Copy of an Order-in-Council approved by His Honor The Lieutenant-Governor, the 31st Day of May, A. D. 1890.

Upon consideration oi the annexed memorandum of Mr. Aubrey White, Assistant Commissioner of Crown Lands, and upon the recommendation of the Honorable the Commissioner, the Committee of Council advise that the necessary steps be taken to prepare for the holding of a Timber Sale in the Districts of Rainy River and Thunder Bay, at such place or places and on such dates as may by order be hereafter fixed.

Certified,

(Signed) J. LONSDALE CAPRÉOL,
Assistant Clerk, Executive Council.

The Honorable,
The Commissioner of Crown Lands.

[Copy.]

Memorandum.

The undersigned has the honor to report that at the time the final judgment of the Privy Council was delivered which established the Province's right to the so-called Disputed Territory, it was found that a number of saw-mills, some of them of considerable capacity, had been erected in the vicinity of Rat Portage and Kingston and were in active operation. These mills had been cutting their supplies of timber under authority granted by the Dominion Government, and had at the time the judgment was received, that is in December, 1888, put their men and supplies in the woods, had commenced cutting and made all preparations to get out their usual annual stock of logs. It was represented to the Government, that great hardship would ensue not only to the mill-owners but to the people of that region generally, if a stop was put to lumbering, the practical effect being to ruin those engaged in the business and throw thousands out of employment, leaving them and their familes destitute at the most inclement season of the year. The undersigned was sent to the spot and made careful enquiry, and as far as possible verified the representations which had been made and found them to be substantially true. It was therefore determined to allow those mill owners to obtain their supplies of timber where they had already commenced cutting, such cutting, however, to be under the surveillance and control of the Crown Timber Agent of this Department and his assistants, and proper sworn returns and measurements to be made.

It was hoped that plans of surveys of the various Indian reserves and other surveys, etc., made under the direction of the Government of Canada, would be obtained in time to enable this Department to lay out timber berths and hold a sale of timber limits last fall, so that the mill-owners would be able to acquire the timber to supply their mills, and that the necessity for special action with respect to the management of timber matters there should be done away with, and the territory brought into line with the general policy and management of Crown timber in the older parts of the Province. Explorations were at once undertaken of what was a *terra incognita* with a view to ascertain where cutting had been done under Dominion authority and to determine where surveys of limits should be made. It was, however, found impossible to obtain last year the plans, etc., from Ottawa, which were necessary before surveys could be undertaken, and the Department was obliged to obtain authority by Order-in-Council to again permit the

obtaining by the various mill-owners of their supplies of timber for this season under the direction and surveillance of its agents and officers, or bring all business in connection with lumbering and the employment, etc., incident thereto, to a sudden stop, which would have created a state of affairs even worse than that which was avoided in the previous year.

The mill-owners are obtaining their supplies for this year under this special authority and regulation, and during the year explorations, etc., have been continued, and the plans of surveys having been obtained from Ottawa, surveys of timber limits have been undertaken and prosecuted with vigor, and the Department is now advised that the necessary plans and reports of certain limits which have been under exploration and survey will be in its hands by about the first day of June.

As the men are usually sent into the woods in the month of September to commence operations for cutting logs, it is desirable that authority should be taken by Order-in-Council to enable the Department to hold a timber sale and to fix the place for the holding of the same so that the Department may take such steps as are necessary at the earliest moment after the necessary information is in its hands with a view to being able to hold such sale not later than, say, the first of September next.

The undersigned therefore respectfully suggests to the Honorable Commissioner of Crown Lands that an Order-in-Council be passed authorizing the Department to take the necessary steps to prepare for the holding of a timber sale in the Rainy River and Thunder Bay districts at such place or places and on such dates as may hereafter be fixed by a subsequent Order-in-Council.

Crown Lands Department,
22nd May, 1890.

(Signed) AUBREY WHITE,
Assistant Commissioner.

[Copy.]

Order-in-Council, Approved 1st July, 1890.

The Committee of Council have had under consideration the annexed Report of the Honorable Commissioner of Crown Lands, with reference to the holding of certain timber sales in the Districts of Rainy River and Thunder Bay, and advise that the recommendations therein contained be concurred in and acted upon.

Certified,

(Signed) J. LONSDALE CAPRÉOL,
Assistant Clerk, Executive Council.

[Copy.]

The undersigned has the honor to state, for the information of the Lieutenant Governor in Council, that the surveys and other information required for the holding of the timer sale in the Rainy River District which was authorized by the Order-in-Council of the 30th May, 1890, are now in the hands of the Department to such an extent as

will warrant the advertising and otherwise giving public notice of the Department's intention to hold such sale, and in this connection it is respectfully recommended that the sale be held upon the first day of October next, at the Crown Lands Department in the City of Toronto. In addition to the territory authorized to be sold under the Order-in-Council referred to, and with a view to putting an end to the permit system in the Thunder Bay District and bringing it in line with the timber policy in force in the rest of the Province, it is respectfully recommended that certain mining locations, berths and areas which are greatly exposed to danger by fire should be sold at the same time and place as above, and also that the east half of the Township of Aweres, near Sault Ste. Marie, or that portion of it which is outside the Indian Reserve, and which is greatly exposed to danger from fire, should likewise be sold at the same time and place, and authority by Order-in-Council for the holding of such further sales is respectfully recommended.

Annexed to this report are maps showing approximately the berths it is proposed to sell. No. 1 showing berths in the Rainy River District; No. 2 those in the Thunder Bay District; and No. 3 shows the east half of the Township of Aweres. There is also annexed hereto the conditions upon which it is proposed to sell these berths, which are submitted for approval and confirmation of the Executive Council. And it is respectfully recommended that so much of the Crown Timber Regulations as may in any manner conflict with the conditions of this sale be suspended for the purposes of this sale, but that such regulations apply in all other respects to the license to be issued and to be in full force except when inconsistent with the special conditions made for the purposes of this sale.

Department of Crown Lands,
Toronto, June 27th, 1890.

(Signed) ARTHUR S. HARDY,
Commissioner.

Department of Crown Lands,
(Woods and Forests Branch),
Toronto, 2nd July, 1890.

NOTICE

Is hereby given that under Order-in-Council certain Timber Berths in the Rainy River and Thunder Bay Districts and a berth composed of part of the Township of Aweres, in the District of Algoma, will be offered for sale by public auction on Wednesday, the first day of October next, at one o'clock in the afternoon, at the Department of Crown Lands, Toronto.

CONDITIONS AND TERMS OF SALE.

Conditions :—Each berth to be adjudged to the person bidding the highest amount of bonus per square mile.

The berths sold to be subject to the "Crown Timber Regulations," except in so far as said regulations may be inconsistent with any conditions herein specified, and to such Orders-in-Council as now exist or may hereafter be passed affecting timber or territory under timber license from the Crown.

The Department reserves the right to one bid on each berth.

No deduction from area sold to be allowed for water.

The timber dues to be the same as now provided by the Crown Timber Regulations and not to be changed for a period of at least seven years from date of this sale.

Timber cut from these limits to be manufactured in the Province.

The purchaser shall be intitled to pine timber only.

For the purpose of making returns to the Department on which Crown dues are to be collected the timber and logs cut on the limits to be sold are to be measured according to the Old Scribner Rule or such rule as the Department of Crown Lands may prescribe.

Re Mining Locations :—Berths including mining locations already patented or which may hereafter be patented will be sold subject to the rights of patentees to take what timber they may require for mining purposes as provided by the General Mining Act.

Terms :—Purchases to the amount of $1,000 or under, to be paid in cash on the day of sale. Purchases over $1,000 and not exceeding $5,000 one-half of bonus to be paid in cash on day of sale and a note or notes, to be given for the remaining half of bonus, payable in three and six months, at a bank in the City of Toronto, with seven per cent. interest.

Purchases over $5,000 and not exceeding $10,000, one-third of bonus to be paid in cash on day of sale and notes to be given for the remaining two-thirds of bonus payable in three and six months, at a bank in the City of Toronto, with seven per cent. interest.

Purchases over $10,000, one-fourth of bonus to be paid in cash on day of sale and notes to be given for the remaining three-fourths of bonus, payable in three, six and nine months, at a bank in the City of Toronto, with seven per cent. interest.

Ground rent for current season to be paid with cash payments of bonus.

Licenses for berths awarded at sale to be issued in due course after payment in full of bonus and ground rent.

Note :—Cash payments are to be made by depositing the same in a bank in the City of Toronto to the credit of the Department of Crown Lands and delivering the certificate of deposit to the Commissioner or Assistant Commissioner of Crown Lands.

Notes given for balances due must be endorsed by names satisfactory to the Department.

Note.—*Change of condition of payment.*—Purchasers over $10,000 may make payment as above provided, or shall have the option of paying instead one-fifth of bonus in cash on day of sale, and notes to be given for the remaining four-fifths of bonus, payable in three, six, nine and twelve months as otherwise above provided.

DESCRIPTION OF TIMBER BERTHS.

Rainy River District.

No. of Berth.	No. of sq. miles.	Description of Berth.
1	23	Situated on Brooks and Otter Lakes.
2	4	On north side of Brooks Lake.
3	10	On south side of Brooks Lake and including all islands therein.
4	13	South of Lake Rowan and west of Twin Lake and Brooks Bay, Lake Rowan.
5	10	South West Bay of Lake Rowan and east of Cameron Lake.

RAINY RIVER DISTRICT.—*Continued.*

No. of Berth.	No. of sq. miles.	Description of Berth.
6	35	Bounded on the east by Lake Rowan, on the south by Cameron, Stephenson and Flint Lakes; on the west by Flint and Sturgeon Lakes, and on the north by Sturgeon and Round Lakes.
7	6	On the north-east side of Lake Rowan and north side of Hill Lake.
8	5	On the north side of Rowan Lake in two blocks.
9	1	On the east side of Hill Lake and point between Brooks Bay and Hill Lake, and islands in Hill Lake.
10	3	On Lawrence Lake, including three points on, and the mainland and all the islands in said lake.
11	15	North of Turtle and Burt Lakes and south of White Pine Lake.
12	3	On north side of Hector's Lake and south of Turtle Lake.
13	7	On Berry Lake.
14	1	On Dryberry Lake.
17	1	" "
18	4	" "
19	11	On north side of Sturgeon Lake and east of Indian Reserve.
20	5	All islands in Crow Lake.
21	4	All islands in Lake Rowan.
25	11	On Split Rock River flowing into Sabiskong Bay, Lake-of-the-Woods.
26	10	West of Dick & Banning's timber berth, letter "A" on the west side of Manitou River flowing into Rainy River.
27	7	On the east side of Manitou River flowing into Rainy River.
28	6	On the north side of North-west Bay on Rainy Lake and east of Indian Reserve.
29	1	On the south side of North-west Bay on Rainy Lake.
30	10	On canoe route north of North-west Bay of Rainy Lake flowing into Rainy Lake and west of Dick & Banning's timber berth letter "B" on Clearwater Lake.
31	5	On canoe route north of Otter Tail Lake, north-west of Jack-fish Lake flowing into North-west Bay of Rainy Lake.
32	7	In township 29, north of second base line, on the south side of Rainy Lake.
33	2	On the north side of La Seine River and east of Indian reserve 23 at mouth of said river, and west of timber berth No. 3, Rainy Lake Lumber Company.
34	9	On north side of La Seine River on Shoal and Sand Lakes, forming part of said river, and east of timber berth No. 3, Rainy Lake Lumber Company.
35	4	On shore of Rainy Lake at entrance of Rat River, with islands, at entrance of Rainy Lake.
36	24	On Nameukon River running into East Bay of Rainy Lake.
37	15	" " "
38	14	" " "
39	12	" " "

RAINY RIVER DISTRICT.—*Continued.*

No. of Berth.	No. of sq. miles.	Description of Berth.
60	5	Situate on both sides of La Seine River, commencing at an island in said river three miles east of a post planted on the south side of La Seine River, marked "W. H. M," at the north-east angle of timber berth No. 2, now held by Dick & Banning.
61	18	Situate on both sides of La Seine River, commencing at a post planted on the east side of Eye River at its junction with La Seine River and the north side of La Seine River.
62	5	Situate on both sides of La Seine River, commencing at a tree on the north side of La Seine River in Small Bay, about two miles east of junction of Eye River with La Seine River, and marked "L. McDonald."
63	2 $\frac{320}{640}$	Situate on the east side of a lake at head of Eye River, and south of the Portage leading into Turtle Lake.
64	13	Situate on Turtle Lake, commencing at a post marked "J. B. 515," planted on Small Island in Turtle Lake, situated about four miles from Eye River Portage.
65	7	Situate on Turtle Lake and its outlet, Little Trout River, commencing on Little Trout River about one mile west of outlet of Turtle Lake, and extending easterly on both sides of said river and lake.
66	8	Situate on east side of Clearwater Lake, north of Turtle Lake, commencing at a post marked "J. B. 516," planted on shore of Clearwater Lake, east of Narrows leading into a small lake.
67	1½	Situate north of Clear Lake, commencing at the outlet of Clearwater Lake and extending along the west side of said outlet.
68	4	Situate on Mink and Pigeon Lakes, commencing at Narrows between Clearwater Lake and Mink Lake and extending on both sides of Mink Lake and on north-west side of Pigeon Lake.
69	10	Situate on Martin Lake in leading into Big Trout River, commencing at rapids running into Martin Lake and extending up said lake on both sides thereof.

THUNDER BAY DISTRICT.

TIMBER BERTH No. 1.—Being west of and adjoining the Township of Pardee, extending west from the intersection of the 3rd and 4th concession line of Pardee with the west boundary about three miles, thence south about four miles, thence east to the west boundary of Pardee, thence north to the place of beginning, comprising about twelve square miles.

NOTE.—The surveyor in laying out this berth added additional territory by mistake or without authority. The sale will be confined to the berth as above described and as contained in the original notice of sale.

TIMBER BERTH No. 2.—Lying between Arrow and Pigeon Rivers, being a block of land situated east of line run in 1883 by P. L. S. De Gurse, from a point six miles west of the north-west angle of the Township of Pardee, and covering (*interalia*) portions of mining locations 78 T and 91 T, 80 T, 81 T, 82 T, 92 T, 93 T and 94 T, comprising about seven square miles.

NOTE.—The surveyor by mistake also omitted to include the block forming part of this berth and lying north of mining locations 79 T to 82 T, both inclusive, but which will be sold as part of said berth No. 2, according to the original description and notice of sale.

TIMBER BERTH No. 3.—Lying between Arrow and Pigeon Rivers, being a block of land situated west of line run in 1883 by P. L. S. De Gurse, from a point six miles west of the north-west angle of the Township of Pardee, and covering (*interalia*) portions of mining locations 78 T and 91 T, 77 T, 76 T, 75 T, 74 T, and part of 73 T, 90 T, 89 T, 88 T, 87 T and part of 86 T, comprising about six and three-quarters square miles.

NOTE.—The same omission as in berth No. 2 was made by the surveyor in his survey of this berth and the block lying north of mining locations 74 T to 78 T will be sold with and as part of berth No. 3, according to the original description and notice of sale.

TIMBER BERTH No. 4.—Lying between Arrow and Pigeon Rivers, and east of South Fowl Lake, being a block of land covering (*interalia*) mining locations 60 T to 72 T, inclusive, and parts of 73 T, 84 T and 85 T, and part of 86 T, comprising about eight and a quarter square miles.

TIMBER BERTH No. 5.—On the south-west side of White Fish Lake, commencing at the water's edge thereof in the north limit of mining location R 265, thence west about one mile, thence south about four miles and a half, thence east about four miles and a half, thence north about three and a half miles to White Fish Lake, thence westerly along the water's edge to place of beginning, comprising about nineteen and a half square miles.

TIMBER BERTH No. 7.—Lying on the north-east side of Mountain Lake, commencing on the international boundary in the east limit of mining location 101 T, thence north about two miles, thence west about two and a half miles, thence south about two miles to Mountain Lake, thence easterly along the water's edge to place of beginning, comprising four square miles, more or less.

TIMBER BERTH No. 8.—On the south shore of Lac des Milles Lacs, thirty-seven and a half square miles as laid out by P. L. S. De Gurse in 1883, commencing at a squared Black Ash tree on a small island at the mouth of a creek entering Lac des Milles Lacs, one mile and a half south-west of the Narrows, thence due south six miles, thence due east six miles, thence due north five miles to a bay of Lac des Milles Lacs, thence following the various windings of the shore to the place of beginning.

ALGOMA DISTRICT.

Township of Aweres.

All that portion of the Township of Aweres lying east of the Indian reserve, consisting of east halves of sections 4, 9, 16, 21, 28 and 33, and the whole of sections 1, 2, 3, 10, 11, 12, 13, 14, 15, 22, 23, 24, that part of 25 lying outside the Indian reserve on the west 26, 27, 34, 35, and that part of 36 lying outside the Indian reserve on the west, comprising in the whole about eighteen and a half square miles more or less.

Note.—Areas of some of the berths which could not be supplied in the first notice are now given.

Note.—It is to be distinctly understood by bidders and purchasers that the notes or comments made upon the plans prepared and submitted at the sale were so made by the surveyor exclusively for the information and convenience of the Department and are in no sense to be construed as a representation by the Department and shall not form the basis of contract between the Department and bidders or purchasers.

ARTHUR S. HARDY,
Commissioner of Crown Lands.

[Copy.]

Toronto, September 30th, 1890.

The undersigned respectfully recommends that the authority of Council be given to read the following notice at the beginning of the sale of timber berths situated in the Port Arthur District:

"Referring to the falls upon the Pigeon River near its mouth, as the improvement of the river is difficult and would involve some considerable expense at this point and is out of the ordinary run of improvements, the Government will recommend an appropriation of a sum not exceeding $10,000 to aid in improving the river at the falls with a view to facilitating the running of logs down to Lake Superior. The work to be done upon such plan and basis and on such terms as shall be approved by the Department of Public Works."

Initialed,
O. M.

(Signed) ARTHUR S. HARDY,
Commissioner of Crown Lands.

To His Honor
The Lieutenant-Governor in Council.

[Copy.]

Copy of an Order-in-Council approved by His Honor the Lieutenant-Governor the 30th day of September, A.D. 1890.

Upon the recommendation of the Honorable the Commissioner of Crown Lands, the Committee of Council advise that the following conditions be added to the conditions of the timber sale advertised for the first day of October prox., namely:

"Purchasers over ten thousand dollars ($10,000) may make payment as above provided, or shall have the option of paying instead one-fifth of bonus in cash on day of sale and to give notes for the remaining four-fifths of bonus at three, six, nine and twelve months, and as otherwise above provided."

Certified,

(Signed) J. R. CARTWRIGHT,
Clerk Executive Council.

The Honorable
The Commissioner of Crown Lands.

RETURN

From the Records of the several Elections to the Legislative Assembly, in the Electoral Districts of the City of Toronto, of the County of Peel, and the City of Toronto, since the General Election of 1890, shewing :—(1) The number of Votes polled for each Candidate in each Electoral District in which there was a contest. (2) The majority whereby each successful Candidate was returned. (3) The total number of Votes polled in each District. (4) The number of Votes remaining unpolled. (5) The number of names on the Voters' List in each District. 6) The population of each District as shewn by the last Census.

CHARLES CLARKE,
Clerk of the Legislative Assembly.

Legislative Assembly,
Toronto, 1893.

RETURN from the records of the several Elections to the Legislative Assembly, in the Electoral Districts of the City of Toronto, of the County of Peel, and the City of Toronto, since the General Election of 1890, shewing:—(1) The number of votes polled for each candidate in each Electoral District in which there was a contest. (2) The majority whereby each successful candidate was returned. (3) The total number of votes polled in each District. (4) The number of votes remaining unpolled. (5) The number of names on the Voters' List in each District. (6) The population of each District as shewn by the last census.

Electoral District.	Names and Numbers of Polling Sub-Divisions.	Names of Candidates and No. of Votes Polled for Each.				Voters in each Sub-Division.			Ballot Papers sent out, and how disposed of in each Sub-Division.						Tendered Ballot Papers sent out and how disposed of in each Sub-Division			Population in each Constituency, as shewn by last Census.
						Total No. of Votes Polled.	No. of Votes remaining Unpolled.	No. of Names on the Voters' Lists.	No. of Ballot Papers sent out to each Sub-Division.	Used Ballot Papers.	Unused Ballot Papers.	Rejected Ballot Papers.	Spoiled Ballot Papers.	Ballot Papers given to Voters who afterwards declined to Vote.	Ballot Papers taken from Polling Places.	No. of Tendered Ballots sent out to each Sub-Division.	Used.	Unused.	
Toronto..	Ward of St. Lawrence—	Bigelow.	Kent.	Thompson.	Macdonald.													
	1						5	5	200		200					20	1	19	29th April, 1892.
	2	2	2			4	4	8	200	4	196					20		20	
	3	5	3			9	21	20	200	9	191	1				20		20	
	4		1	1		2	2	4	200	2	198					20		20	
	5	2	1			3	10	13	200	3	197					20		20	
	6	6	1			7	4	11	200	7	193					20	2	18	
	7	5	9	1	1	16	29	45	200	16	184					20			
	8	30	9			41	23	64	200	43	157	2				20	4	16	
	9	21	14			35	53	88	200	35	165					20		20	
	10	15	17			34	60	92	200	32	168	2				20		20	
	11	16	13	1	1	32	125	157	200	32	168	1				20		20	
	12	20	24	2	2	48	102	150	200	48	152					20		20	
	13	9	35	2		46	124	170	200	46	154					20	1	19	
	14	16	16	2		35	94	129	200	35	165		1			20		20	
	15	20	33	4		57	77	134	200	57	143					20		20	
	16	10	26	1		39	90	119	200	39	161		2			20	2	18	
	17	9	26	3	1	39	91	130	200	39	161					20		20	
	18	10	11	4		26	57	83	200	26	174		1			20	1	19	
	19	4	12			16	55	71	200	16	184					20		20	
	20	4	3			7	43	50	200	7	193					20		20	
	Totals	204	256	21	5	486	1049	1543	4000	496	3504	6	4			400	11	389	
	Majority for Kent		52																

Toronto—Con																	
Ward of St. Paul—																	
1	7	6	1		14	52	66	200	14	186					20		20
2	7	5			12	29	41	200	12	188					20		20
3	8	2			10	21	31	200	10	190					20		20
4	22	20		1	43	90	133	200	43	157					20		20
5	10	16			26	87	113	200	26	174					20		20
6	28	25	3		56	136	192	200	56	144					20		20
7	37	24	2	3	66	98	164	200	66	134					20	3	17
8	33	36	7	1	77	96	173	200	78	122					20		20
9	30	34	3		67	125	192	200	69	131		1			20		20
10	10	8	1		19	120	139	200	19	181		2			20		20
11	7	9	1	1	17	89	106	200	17	183					20		20
12	20	8			28	97	125	200	28	172					20		20
13	23	14	2		39	81	120	200	39	161					20		20
14	11	9	1		21	63	84	200	21	179					20	1	19
15	14	14		1	29	84	113	200	29	171					20	4	16
16	19	9	2		30	30	90	200	30	170					20		20
17	14	6	1	1	22	77	99	200	22	178					20	3	17
18	33	13	2		49	86	135	200	49	151	1				20		20
Totals	333	258	26	8	625	1461	2086	3600	628	2972	1	3			360	11	349
Majority for Bigelow	75																
Ward of St. John—																	
1	10	4			14	64	78	200	15	185	1				20		20
2	12	14	2		28	93	121	200	28	172					20		20
3	14	12		2	29	90	119	200	29	171					20	2	18
4	13	24	2		39	93	132	200	39	161					20		20
5	16	10	1		27	98	125	200	29	171	1	1			20		20
6	27	18		1	46	110	156	200	46	154					20		20
7	25	18			43	72	115	200	44	156	1				20	1	19
8	13	14	1	1	29	133	162	200	29	171					20		20
9	13	12	1		26	93	119	200	29	171		3			20		20
10	8	30	1		39	115	154	200	39	161	1				20		20
11	16	27	3		46	74	120	200	46	154					20	2	18
12	13	18	2	1	34	107	141	200	34	166					20		20
13	5	9	1	1	16	72	88	200	16	184					20		20
14	13	17	1	1	32	87	119	200	33	167	1				20		20
15	9	20	1	1	31	98	129	200	32	168	1				20		20
16	6	15	1	2	24	96	120	200	25	175		1			20		20
17	38	15	3		56	76	132	200	56	144					20		20
18	37	15			52	84	136	200	53	147		1			20		20
19	21	16	4		41	100	141	200	41	159					20		20
20	45	9	2		56	104	160	200	58	142	2				20		20
21	35	11	2		48	80	128	200	51	149		3			20	1	19
Totals	389	328	28	10	755	1940	2695	4200	772	3428	8	9			420	6	414
Majority for Bigelow	61																

RETURNS from the records of the several Elections to the Legislative Assembly in 1892.—*Continued.*

Electoral District.	Names and Numbers of Polling Sub-Divisions.	Names of Candidates and No. of Votes Polled for Each.				Voters in each Sub-Division.			Ballot Papers sent out, and how disposed of in each Sub-Division.							Tendered Ballot Papers sent out and how disposed of in each Sub-Division			Population in each Constituency, as shewn by last Census.
						Total No. of Votes Polled.	No. of Votes remaining Unpolled.	No. of Names on the Voters' Lists.	No. of Ballot Papers sent out to each Sub-Division.	Used Ballot Papers.	Unused Ballot Papers.	Rejected Ballot Papers.	Spoiled Ballot Papers.	Ballot Papers given to Voters who afterwards declined to Vote.	Ballot Papers taken from Polling Places.	No. of Tendered Ballots sent out to each Sub-Division.	Used.	Unused.	
Toronto—*Con*	Ward of St. Matthews—	Bigelow.	Kent.	Thompson.	Macdonald.														
	1	14	45	1	2	62	107	169	200	62	138	....	....	....	....	20	....	20	29th April, 1892.
	2	9	27	3	1	40	97	137	200	40	160	....	....	....	....	20	1	19	
	3	14	12	1	....	27	102	129	200	29	171	....	2	....	....	20	1	19	
	4	11	33	6	....	50	106	156	200	50	150	....	....	....	....	20	....	20	
	5	15	20	4	1	40	119	159	200	40	160	....	....	....	....	20	....	20	
	6	14	18	2	5	39	92	131	200	39	161	....	....	....	....	20	....	20	
	7	12	15	3	....	30	81	111	200	31	169	1	....	....	....	20	1	19	
	8	9	20	4	1	34	97	131	200	34	166	....	....	....	....	20	....	20	
	9	9	8	1	1	19	40	59	200	19	181	....	....	....	....	20	1	19	
	10	8	13	1	....	22	96	118	200	22	178	....	....	....	....	20	....	20	
	11	5	24	2	....	31	88	119	200	32	168	....	1	....	....	20	....	20	
	12	14	7	....	....	21	69	90	200	21	179	....	....	....	....	20	....	20	
	13	1	2	....	....	3	35	38	200	3	197	....	....	....	....	20	1	19	
	14	5	7	....	....	12	79	91	200	12	188	....	....	....	....	20	....	20	
	Totals	140	251	28	11	430	1208	1638	2800	434	2366	1	3	....	....	280	5	275	
	Majority for Kent	....	111																
	Ward of St. George—																		
	1	2	....	....	....	2	17	19	200	2	198	....	....	....	....	20	3	17	
	2	10	2	....	....	12	...	9	200	12	188	....	....	....	....	20	3	17	
	3	5	2	....	....	7	94	101	200	7	193	....	....	....	....	20	1	19	
	4	1	....	....	....	1	....	1	200	1	199	....	....	....	....	20	....	20	

| | | |

RETURNS from the records of the several Elections to the Legislative Assembly in 1892.—*Continued.*

Electoral District.	Names and Numbers of Polling Sub-Divisions.	Names of Candidates and No. of Votes Polled for Each.				Voters in each Sub-Division.			Ballot Papers sent out, and how disposed of in each Sub-Division.							Tendered Ballot Papers sent out and how disposed of in each Sub-division			Population in each Constituency, as shewn by last Census.
						Total No. of Votes Polled.	No. of Votes remaining Unpolled.	No. of Names on the Voters' Lists.	No. of Ballot Papers sent out to each Sub-Division.	Used Ballot Papers.	Unused Ballot Papers.	Rejected Ballot Papers.	Spoiled Ballot Papers.	Ballot Papers given to Voters who afterwards declined to Vote.	Ballot Papers taken from Polling Places.	No. of Tendered Ballots sent out to each Sub-division.	Used.	Unused.	
Toronto — *Con*	Ward of St. David—	Bigelow.	Kent.	Thompson.	Macdonald.														
	1	13	10	7	1	31	132	163	200	31	169	....	....	.....	.....	20	.....	20	29th April, 1892.
	2	20	22	1	.....	43	120	163	200	46	154	3	....	.....	.....	20	.....	20	
	3	16	11	2	.....	29	143	172	200	29	171	....	....	.....	.....	20	.....	20	
	4	20	15	2	.....	37	142	179	200	37	163	....	....	.....	.....	20	.....	20	
	5	20	17	2	2	41	122	163	200	41	159	....	....	.....	.....	20	1	19	
	6	15	28	3	.....	46	101	147	200	46	154	....	....	.....	.....	20	.....	20	
	7	8	11	5	3	27	122	149	200	27	173	....	....	.....	.....	20	.....	20	
	8	16	27	2	.....	45	123	168	200	45	155	....	....	.....	.....	20	1	19	
	9	16	32	6	1	55	89	144	200	55	145	....	....	.....	.....	20	3	17	
	10	10	15	2	.....	27	117	144	200	27	173	....	....	.....	.....	20	2	18	
	11	8	23	2	1	34	124	158	200	34	166	....	....	.....	.....	20	.....	20	
	12	14	15	4	1	34	105	139	200	34	166	....	....	.....	.....	20	.....	20	
	13	16	32	4	1	53	98	151	200	53	147	....	....	.....	.....	20	.....	19	
	14	33	29	1	1	64	95	159	200	64	136	....	....	.....	.....	20	.....	20	
	15	23	36	2	1	62	97	159	200	64	136	1	1	.....	.....	20	1	19	
	16	18	23	1	.....	42	123	165	200	42	158	....	....	.....	.....	20	2	18	
	17	11	18	2	.....	32	119	151	200	32	168	....	....	.....	.....	20	1	19	
	18	14	17	2	.....	33	87	120	200	33	167	1	....	.....	.....	20	.....	20	
	19	7	28	3	1	39	114	153	200	39	161	....	....	.....	.....	20	.....	20	
	20	26	28	2	.....	56	67	123	200	56	144	....	....	.....	.....	20	.....	20	
	21	9	10	2	1	22	78	100	200	22	178	....	....	.....	.....	20	2	18	
	22	15	26	2	1	44	116	160	200	44	156	1	....	.....	.....	20	.....	20	
	23	20	24	2	.....	46	74	120	200	46	154	....	....	.....	.....	20	.....	20	
	24	30	11	4	.....	45	77	122	200	45	155	....	....	.....	.....	20	.....	20	
	25	23	17	3	1	44	114	158	200	44	156	....	1	.....	.....	20	.....	20	
	26	19	11	1	.....	31	75	106	200	31	169	....	....	.....	.....	20	.....	20	
	27	26	13	1	1	41	104	145	200	41	159	....	....	.....	.....	20	.....	20	

28	27	13	2	2	44	105	149	200	44	156	....	....	.....	.....	20	.....	20
29	15	8	2	.....	25	84	109	200	25	175	....	....	.....	.....	20	.....	20
30	15	13	1	.....	29	71	100	200	29	171	....	....	.....	.....	20	1	19
Totals	523	583	76	19	1201	3138	4339	6000	1206	4794	6	2	.....	.. ..	600	14	586
Majority for Kent		60															
Ward of St. Alban's—																	
1	34	15	1	.....	50	91	141	200	50	150	....	....	.....	.....	20	.....	20
2	28	40	5	2	75	82	157	200	75	125	....	....	.....	...	20	.....	20
3	16	6	2	.....	24	35	59	200	24	176	1	....	.....	.....	20	.....	20
4	17	15	.....	1	33	39	72	200	33	167	....	....	.....	.....	20	.....	20
5	21	11	.....	1	33	54	87	200	33	167	....	....	.....	.....	20	.....	20
6	20	19	1	2	42	70	112	200	70	130	....	....	.....	.....	20	.....	20
7	25	35	.....	.....	60	75	136	200	61	139	....	....	.. ..	.....	20	.....	20
8	27	32	1	1	61	89	150	200	62	138	....	1	.....	.....	20	.....	20
9	13	32	1	.....	46	96	142	200	46	154	....	....	.....	.....	20	.. ..	20
10	17	22	2	1	42	87	129	200	42	158	....	....	.....	.....	20	2	18
11	11	15	2	.....	29	63	91	200	29	171	....	1	.....	.....	20	.....	20
12	14	18	.....	.....	32	76	108	200	32	168	....	....	.....	.....	20	1	19
Totals	243	260	15	8	526	858	1384	2400	557	1843	1	2	.....	.....	240	3	237
Majority for Kent		17															
Ward of St. Andrew's																	
1	6	13	.....	.....	29	13	32	200	20	180	....	....	.....	.....	20	1	19
2	5	13	.....	.....	18	38	56	200	19	181	....	1	.....	.....	20	1	19
3	8	7	1	.....	16	27	43	200	16	184	....	....	.....	.....	20	4	16
4	3	2	....	.....	5	14	19	200	5	195	....	....	.....	.....	20	3	17
5	9	4	.....	.....	13	48	61	200	13	187	....	....	.....	.....	20	.....	20
6	10	14	3	1	28	82	110	200	28	172	....	....	.....	.....	20	....	20
7	18	5	.....	.....	23	58	81	200	23	177	....	....	.....	.....	20	.....	20
8	16	6	2	1	25	57	82	200	25	175	....	....	.....	.....	20	2	18
9	10	17	2	1	30	103	133	200	30	170	...	....	.....	.....	20	1	19
10	24	14	1	4	43	89	132	200	43	157	...	....	.....	.....	20	1	19
11	15	24	4	3	46	94	140	200	46	154	....	....	.....	.....	20	.....	20
12	12	23	3	.....	38	91	129	200	38	162	....	....	.....	....	20	1	19
13	5	15	.. ..	....	20	113	133	200	20	180	....	....	.....	.....	20	.....	20
14	14	14	5	.....	33	102	135	200	33	167	....	....	...	.....	20	2	18
15	18	15	2	.....	36	86	121	200	36	164	...	....	.....	.....	20	.....	20
16	28	12	5	.....	45	109	154	200	45	155	....	....	.....	.....	20	.....	20
17	30	11	3	.....	44	80	124	200	44	156	....	1	.....	.....	20	.....	20
18	10	11	7	1	29	95	124	200	29	171	....	..	.....	.....	20	.....	20

RETURNS from the records of the several Elections to the Legislative Assembly in 1892.—*Continued.*

Electoral District.	Names and Numbers of Polling Sub-Divisions.	Names of Candidates and No. of Votes Polled for Each.				Voters in each Sub-Division.			Ballot Papers sent out, and how disposed of in each Sub-Division.						Tendered Ballot Papers sent out and how disposed of in each Sub-Division			Population in each Constituency, as shewn by last Census.
						Total No. of Votes Polled.	No. of Votes remaining Unpolled.	No. of Names on the Voters' Lists.	No. of Ballot Papers sent out to each Sub-Division.	Used Ballot Papers.	Unused Ballot Papers.	Rejected Ballot Papers.	Spoiled Ballot Papers.	Ballot Papers given to Voters who afterwards declined to Vote.	Ballot Papers taken from Polling Places.	No. of Tendered Ballots sent out to each Sub-division.	Used.	Unused.	
Toronto—*Con.*	Ward of St. Andrew—	Bigelow.	Kent.	Thompson.	Macdonald.													
	19	10	8	7	.....	25	97	122	200	25	175	....	....	.....	.....	20	1	19	29th April, 1892.
	20	19	17	5	.....	41	74	115	200	41	159	....	....	.....	.....	20	.....	20	
	21	10	17	4	.....	31	87	118	200	31	169	....	....	.....	.....	20	1	19	
	22	18	20	2	2	42	75	117	200	43	157	1	....	.....	.....	20	.....	20	
	Totals	298	282	56	13	649	1632	2281	4400	653	3747	1	2	.....	.....	440	18	422	
	Majority for Bigelow.	16																	
	Ward of St. Mark.—																		
	1	20	13	.....	.....	33	70	103	200	33	167	....	....	.....	.....	20	.....	20	
	2	18	17	2	1	38	82	120	200	38	162	....	....	.....	.....	20	.....	20	
	3	8	11	1	.....	20	111	131	200	20	180	....	....	.....	.....	20	.....	20	
	4	18	15	2	.....	35	107	142	200	35	165	....	....	.....	.....	20	.....	20	
	5	13	20	1	.....	34	109	143	200	34	166	....	....	.....	.....	20	1	19	
	6	14	18	1	1	34	84	118	200	35	165	1	....	.....	.....	20	.....	20	
	7	16	18	1	2	37	104	141	200	37	163	....	....	.....	.....	20	1	19	
	8	15	16	2	.....	33	97	130	200	34	166	....	1	.....	.....	20	1	19	
	9	9	16	1	1	27	114	141	200	27	173	....	....	.....	.....	20	.....	20	
	10	13	9	.....	.....	22	60	82	200	22	178	....	....	.....	.....	20	.....	20	
	11	8	10	.....	.....	18	87	105	200	18	182	....	....	.....	.....	20	.....	20	
	12	6	7	3	3	19	73	92	200	19	181	....	....	.....	.....	20	.....	20	
	13	18		2	.....	28	70	98	200	29	171	....	1	.....	.....	20	1	19	
	14	11		.....	.....	18	74	92	200	18	182	....	....	.....	.....	20	.....	20	

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RETURNS from the records of the several Elections to the Legislative Assembly in 1892.—*Continued.*

Electoral District.	Names and Numbers of Polling Sub-Divisions.	Names of Candidates and No. of Votes Polled for Each.				Voters in each Sub-Division.			Ballot Papers sent out, and how disposed of in each Sub-Division.							Tendered Ballot Papers sent out and how disposed of in each Sub-division.			Population in each Constituency, as shewn by last Census.
						Total No. of Votes Polled.	No. of Votes remaining Unpolled.	No. of names on the Voters' Lists.	No. of Ballot Papers sent out to each Sub-Division.	Used Ballot Papers.	Unused Ballot Papers.	Rejected Ballot Papers.	Spoiled Ballot Papers.	Ballot Papers given to Voters who afterwards declined to Vote.	Ballot Papers taken from Polling Places.	No. of Tendered Ballots sent out to each Sub-division.	Used.	Unused.	
Toronto—																			
Con	Ward of St. Patrick—	Bigelow.	Kent.	Thompson.	Macdonald.														
	9	33	16	2	1	52	86	138	200	52	148	....	....	.....	.....	20	1	19	29th April, 1892.
	10	30	15	4	1	50	75	125	200	50	150	....	....	.....	.....	20	5	15	
	11	25	22	1	2	50	69	119	200	53	177	....	3	.....	.....	20	.....	20	
	12	21	25	3	.....	49	87	136	200	49	151	....	....	.....	.....	20	.....	20	
	13	21	20	.....	1	42	113	155	200	42	158	....	....	.....	...	20	1	19	
	14	19	11	7	.....	37	104	141	200	37	163	....	....	.....	.....	20	.....	20	
	15	20	16	1	1	38	92	130	200	39	161	1	....	.....	.....	20	.....	20	
	16	17	7	2	.....	26	88	114	200	26	174	....	...	.....	.....	20	.....	20	
	17	17	16	3	.....	36	90	126	200	36	164	....	....	.....	.....	20	3	17	
	18	15	10	5	.....	30	75	105	200	30	170	....	....	.....	.....	20	.....	20	
	19	14	27	2	1	44	96	140	200	44	156	....	....	.....	.....	20	1	19	
	20	20	15	4	2	41	109	150	200	41	159	....	....	.....	.....	20	.....	20	
	21	17	22	3	.....	42	90	132	200	42	158	....	....	.....	.....	20	.....	20	
	22	18	13	1	3	35	82	117	200	35	165	....	....	.....	.....	20	2	18	
	23	47	12	.....	1	60	83	143	200	60	140	....	....	.....	.....	20	.....	20	
	24	9	13	4	.....	26	174	100	200	26	184	....	...	.....	.....	20	10	10	
	25	22	18	.....	1	41	103	144	200	41	159	....	....	.....	.....	20	.....	20	
	26	32	18	1	.....	51	78	129	200	51	149	....	....	.....	.....	20	.....	20	
	27	22	26	1	2	51	70	121	200	51	149	....	....	.....	.....	20	1	19	
	28	33	25	2	1	61	70	131	200	62	138	1	....	.....	.....	20	1	19	
	29	18	14	.....	.....	32	83	115	200	32	168	....	....	.....	.....	20	.....	20	
	30	15	23	4	1	43	106	149	200	43	157	....	....	.....	.....	20	.....	20	
	31	18	23	2	.....	43	91	134	200	44	156	1	....	.....	.....	20	1	19	
	32	20	29	2	2	53	98	151	200	53	147	....	....	.....	.....	20	1	19	
	33	12	17	2	.....	31	85	166	200	32	168	1	....	.....	.....	20	.....	20	
	34	16	14	1	1	32	93	125	200	32	168	....	....	.....	.....	20	.....	20	
	35	17	15	.....	2	34	113	147	200	36	164	1	1	.....	.....	20	.....	20	
	36	11	16	6	.....	35	127	160	200	35	165	1	1	.....	.....	20	.....	20	

37	16	16	2		34	85	119	200	34	166	1	....	.....	....	20	.....	20	
Totals	749	664	81	31	1525	3328	4853	7400	1559	5841	9	6	.....	.....	7400	39	7361	
Majority for Bigelow	85																	
Ward of St. Stephen—																		
1	21	15	2	1	39	94	133	200	40	160	....	1	.....	.....	20	.....	20	
2	30	17	5	....	52	91	143	200	52	148	1	....	.....	.....	20	.....	20	
3	15	16	5	1	37	82	119	200	37	163	1	....	.....	.....	20	.....	20	
4	20	20	4	.....	46	105	151	200	46	154	1	1	.....	.....	20	.....	20	
5	9	21	2	....	32	100	132	200	32	168	....	....	.....	.....	20	1	19	
6	12	10	5	1	28	88	116	200	28	172	....	....	.....	.....	20	.....	20	
7	24	15	5	2	46	114	160	200	46	154	....	....	.....	.....	20	1	19	
8	40	8	1	1	50	56	106	200	50	150	....	....	....	.....	20	.....	20	
9	17	25	1	1	44	98	142	200	44	156	....	....	.....	.....	20	.. ...	20	
10	17	26	3	.....	46	104	150	200	46	154	....	....	.....	.....	20	.....	20	
11	13	12	3	.....	28	97	125	200	29	171	....	1	.....	.....	20	.....	20	
12	21	18	3	.....	42	81	123	200	42	158	....	....	.....	.....	20	1	19	
13	26	17	1	.....	44	77	121	200	44	156	....	...	.....	.....	20	2	18	
14	15	10	.....	1	26	86	112	200	26	174	....	....	.....	.....	20	.....	20	
15	22	25	4	... .	51	90	141	200	51	149	....	....	.....	....	20	.....	20	
16	19	21	2	.....	42	88	130	200	42	158	....	....	.....	.....	20	.....	20	
17	20	19	5	2	46	82	128	200	46	154	....	....	.....	.....	20	.....	20	
18	18	16	3	1	38	94	132	200	38	162	....	....	.....	...	20	.....	20	
19	42	5	3	.....	50	68	118	200	50	150	....	....	.....	.....	20	3	17	
20	15	17	3	.....	35	114	149	200	35	165	....	....	.....	.....	20	.....	20	
21	33	10	2	.....	45	50	95	200	45	155	....	....	.....	.....	20	.....	20	
22	20	12	1	.....	33	77	110	200	33	167	....	....	.....	.....	20	.....	20	
23	15	9	1	.....	25	63	88	200	25	175	....	....	.....	.....	20	.....	20	
24	36	4	.....	.....	40	45	85	200	40	160	....	....	.....	.....	20	3	17	
25	22	12	1	2	37	83	120	200	37	163	....	....	.....	.....	20	.....	20	
26	16	11	4	.....	31	62	93	200	31	169	....	....	.....	.....	20	.....	.....	
27	96	8	8	3	115	36	151	200	115	85	....	....	.....	.....	20	.....	20	
28	17	4	1	....	22	29	51	200	22	178	....	....	.....	.....	20	.....	20	
29	28	7	1	.....	36	67	103	200	37	163	1	....	.....	.....	20	4	16	
30	9	4	.....	.....	13	41	54	200	14	186	1	....	.....	.....	20	.....	20	
31	16	24	1	.....	41	81	122	200	41	159	....	....	.....	.....	20	.....	20	
32	6	15	1	....	22	80	102	200	23	177	....	1	.....	.....	20	1	19	
33	7	8	1	.....	16	85	101	200	16	184	....	...	.....	.....	20	.....	20	
34	3	5	1	.....	9	86	95	200	9	191	....	....	.....	.....	20	.....	20	
35	13	12	.....	.....	25	68	93	200	26	174	....	1	.....	.....	20	.....	20	
36	25	8	1	1	35	42	97	200	39	163	....	2	.....	.....	20	.....	20	
Totals	778	486	84	17	1365	2315	3680	7200	1375	5825	5	7	.....	.....	720	16	704	181220
Majority for Bigelow	292																	

PETER RYAN,
Returning Officer for the Electoral District of the City of Toronto.

RECAPITULATION of Votes polled for each Candidate at the several Polling Sub-divisions of the Electoral District of the County of Peel at an Election held on the 30th day of December, 1892.

Electoral District.	Names and Numbers of Polling Sub-divisions.	Names of Candidates and No. of Votes Polled for each.		Voters in each Sub-Division.			Ballot Papers sent out, and how Disposed of in each Sub-Division.							Tendered Ballot Papers sent out and how disposed of in each Sub-division.			Population in each Constituency, as shewn by last Census.
				Total No. of Votes Polled.	No. of Votes Remaining Unpolled.	No. of Names on the Voters' Lists.	No. of Ballot Papers sent out to each Sub-Division.	Used Ballot Papers.	Unused Ballot Papers.	Rejected Ballot Papers.	Spoiled Ballot Papers.	Ballot Papers given to Voters who afterwards declined to Vote.	Ballot Papers taken from Polling Places.	No. of Tendered Ballots sent out to each Sub-division.	Used.	Unused.	
		Mr. W. Cook.	John Smith.														30th Dec'r, 1892.
Peel	Brampton.																
	East Ward	66	93	159	71	230	250	159	87	4	....	.....	.....	25	.....	25	
	North do	55	92	147	101	248	250	147	103	....	....	.....	.....	25	1	24	
	West do	64	84	148	75	223	249	148	98	2	1	.....	.....	25	.....	25	
	South do	58	89	147	115	262	250	147	103	....	....	.....	.....	25	.....	25	
	Chinguacousy.																
	1. Norton	38	82	120	37	157	250	120	129	1	....	.....	.....	25	.....	25	
	2. Mayfield.....	51	87	138	55	193	250	138	111	1	....	.....	.....	25	.....	25	
	3. Sandhill,.....	32	83	115	49	164	250	115	135	....	....	.....	.....	25	.....	25	
	4. Huttonville.	65	56	121	58	179	250	121	124	1	4	.....	.....	25	.....	25	
	5. Alloa.....	31	90	121	31	152	250	121	129	....	....	.....	.....	25	.....	25	
	6. Cheltenham.....	33	100	133	50	183	250	133	116	1	....	.....	.....	25	1	24	
	7. Westervelt.....	32	107	139	49	188	250	139	110	....	1	.....	.....	25	.....	25	
	8. Victoria	46	88	134	47	181	249	134	115	....	....	.....	.....	25	.....	25	
	Toronto Gore.																
	1 Grahamsville	22	85	107	42	149	250	107	143	....	....	.....	.....	25	.....	25	
	2. Castlemore.....	39	66	105	42	147	249	105	143	1	....	.....	.....	25	.....	25	

Toronto.																
1. Port Credit	78	56	134	55	189	250	134	114	2	2	.....	.....	25	.....	25	
2. Springfield	40	58	98	42	140	250	98	150	2	....	.....	.....	25	.....	25	
3. Cooksville	95	52	147	26	173	250	147	101	2	....	.....	.....	25	.....	25	
4. Dixie	56	67	123	31	154	250	123	147	....	....	.....	.....	25	.....	25	
5. Harris' Corners	70	42	112	45	157	250	112	137	....	1	.....	.....	25	1	24	
6. Meadowvale	64	87	151	32	183	250	151	97	2	....	.....	.....	25	.....	25	
7. Palestine	57	61	118	26	144	250	118	132	....	....	.....	.....	25	.....	25	
8. Malta	33	75	108	67	175	250	108	142	....	....	.....	.....	25	3	22	
9. Clarkson	34	88	122	69	191	250	122	127	1	....	.....	.....	25	.....	25	
Caledon.																
1. Belfountain	51	156	207	44	251	250	207	42	1	....	.....	.....	25	1	24	
2. Inglewood	20	105	125	33	158	250	125	125	..	....	.....	....	25	.....	25	
3. Caledon East	49	64	113	29	142	250	113	137	....	....	.....	.....	25	.....	25	
4. Mara Mills	39	68	107	70	177	249	107	142	....	....	.....	.....	25	.....	25	
5. Charleston	59	84	143	69	212	250	143	105	2	....	.....	.....	25	.....	25	
6. Alton	80	85	165	74	239	250	165	84	1	....	.....	.....	25	2	23	
7. Cataract	16	101	117	53	170	250	117	133	..	....	.....	.....	25	.....	25	
Streetsville	91	26	117	26	143	250	117	132	1	....	.....	.....	25	.....	25	
Totals	1,564	2,477	4,041	1,613	5,654	7,746	4,041	3,673	23	9	.....	.....	775	9	766	15,466
Majority for John Smith		913														

ROBERT BRODDY,

Returning Officer for the County of Peel.

RETURNS from the records of the several Elections to the Legislative Assembly in 1893.—*Continued.*

Electoral District.	Names and Numbers of Polling Sub-Divisions.	Names of Candidates and No. of Votes polled for each.			Voters in each Sub-Division.			Ballot Papers sent out, and how disposed of in each Sub-Division.							Tendered Ballot Papers sent out and how disposed of in each Sub-division.			Population in each Constituency, as shewn by last Census.
					Total No. of Votes polled.	No. of Votes remaining unpolled.	No. of Names on the Voters' List.	No. of Ballot Papers sent out to each Sub-Division.	Used Ballot Papers.	Unused Ballot Papers.	Rejected Ballot Papers.	Spoiled Ballot Papers.	Ballot Papers given to Voters who afterwards declined to Vote.	Ballot Papers taken from Polling Placee.	No. of Tendered Ballots sent out to each Sub-division.	Used.	Unused.	
Toronto—	Ward No. 1—	Ryerson.	Ogden.	Thompson														28th Feb'y, 1893.
	1	31	26	3	60	86	146	200	60	140	.....	.....	.....	.....	20	1	19	
	2	55	13	7	75	45	120	200	76	123	.....	1	.....	.....	20	.....	20	
	3	33	18	2	53	82	135	200	53	147	.....	.....	.....	....	20	.....	20	
	4	65	21	4	90	70	160	200	91	108	1	.....	...	.....	20	.....	20	
	5	40	17	2	59	85	144	200	60	138	1	1	.....	.....	20	1	19	
	6	61	22	1	84	62	146	200	86	112	1	1	.....	.....	20	.....	20	
	7	25	9	2	36	47	83	200	36	164	.....	....	....	.....	20	.....	20	
	8	25	13	.....	38	50	88	200	39	160	.....	1	.....	.....	20	.....	20	
	9	10	8	1	19	31	50	200	19	181	.....	.....	.....	....	20	.....	20	
	10	29	9	.....	38	53	91	200	38	162	.....	.....	.....	.....	20	.....	20	
	11	64	22	2	88	75	163	200	90	108	1	1	.....	.....	20	.....	20	
	12	34	20	8	64	80	142	200	64	134	.....	2	.....	.....	20	.....	20	
	13	57	12	1	70	84	154	200	70	130	.....	.....	.....	.....	20	1	19	
	14	51	16	4	71	96	167	200	71	129	.....	.....	.....	.....	20	.....	20	
	15	28	12	2	42	57	99	200	42	158	.....	.....	.....	.....	20	.....	20	
	16	65	23	3	91	124	215	200	91	109	.....	.....	.....	.....	20	.....	20	
	17	58	13	3	74	89	163	200	75	124	.....	1	.....	.....	20	.....	20	
	18	47	16	3	66	77	143	200	66	134	.....	.....	.....	....	20	.....	20	
	19	63	20	3	86	102	188	200	86	114	.....	.....	.....	.....	20	.....	20	
	20	36	19	2	57	107	164	200	58	141	1	.....	.....	.....	20	.....	20	
	21	46	19	5	70	70	140	200	71	128	.....	1	.....	.....	20	1	19	
	22	31	17	4	52	76	128	200	52	148	.....	.....	.....	.....	20	1	19	
	23	27	15	2	44	82	126	200	44	156	.....	.....	...	.....	20	.....	20	
	24	27	25	2	54	66	120	200	57	140	.....	3	.....	.....	20	.....	20	
	25	15	11	.....	20	30	56	200	26	174	.....	.....	.....	.....	20	.....	20	

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RETURN from the records of the several Elections to the Legislative Assembly in 1893.—*Continued.*

Electoral Districts.	Names and Numbers of Polling Sub-Divisions.	Names of Candidates and No. of Votes polled for each.			Voters in each Sub-Division.			Ballot Papers sent out, and how disposed of in each Sub-Division.							Tendered Ballot Papers sent out and how disposed of in each Sub-division.			Population in each Constituency, as shewn by last Census.
					Total No. of Votes polled.	No. of Votes remaining unpolled.	No. of Names on the Voters' List.	No. of Ballot Papers sent out to each Sub-Division.	Used Ballot Papers.	Unused Ballot Papers.	Rejected Ballot Papers.	Spoiled Ballot Papers.	Ballot Papers given to Voters who afterwards declined to vote.	Ballot Papers taken from Polling Places.	No. of tendered Ballots sent out to each Sub-division.	Used.	Unused.	
Toronto—*Con*	Ward No. 2—*Continued.*	Ryerson.	Ogden.	Thompson														
	40	15	22	4	41	80	121	200	42	157	1	.....	.....	.....	20	.....	20	28th Feb'y, 1893.
	41	28	42	5	75	80	155	200	75	125	.....	.....	.....	.....	20	.....	20	
	42	30	22	.....	52	103	155	200	52	148	.....	.....	.....	....	20	1	19	
	43	17	26	1	44	68	112	200	44	156	.....	.....	.....	.....	20	1	19	
	44	25	25	2	52	65	117	200	52	148	.....	.....	.....	.....	20	.....	20	
	45	23	35	.....	58	100	158	200	58	142	.....	.....	.....	.....	20	.....	20	
	46	20	39	3	62	83	145	200	62	138	..	.....	.....	.....	20	1	19	
	47	17	31	.....	48	55	103	200	48	152	.....	.....	.....	.....	20	.....	20	
	48	12	25	2	39	68	107	200	39	161	.....	.....	.....	.....	20	1	19	
	49	17	53	2	72	80	152	200	73	126	1	.....	.....	.....	20	.....	20	
	Totals	1,501	1,466	104	3,071	4,075	7,146	9,800	3,073	6,690	16	21	.....	.. .	980	13	967	
	Majority for Ryerson..	35																
	Ward No. 3—																	
	1	22	21	.....	43	47	90	200	43	157	.....	.....	.....	.....	20	.....	20	
	2	5	10	.....	15	13	28	200	15	185	.....	.....	.....	.....	20	...	20	
	3	3	10	.....	13	20	33	200	13	187	.....	.....	.....	.....	20	....	20	
	4	1	2	.....	3	.....	3	200	3	197	.....	.....	.....	.....	20	.....	20	
	5	1	.....	.....	1	1	2	200	1	199	.....	.....	.....	.....	20	.....	20	
	6	3	6	.....	9	7	16	200	9	191	.....	.....	.....	..	20	1	19	
	7	8	3	.....	11	8	19	200	8	192	.....	.....	.....	.....	20	....	20	
	8	.....	.....	.....	.....	4	4	200	.....	200	.....	.....	.....	.....	20	.....	20	
	9	6	5	1	12	13	25	200	12	188	.....	.....	.....	.....	20	.....	20	
	10	4	.....	.....	4	6	10	200	4	196	.....	.....	.....	.....	20	.....	20	
	11	1	2	.....	3	11	14	200	3	197	.....	.....	.....	.....	20	.....	20	
	12	1	2	.....	3	9	12	200	3	197	.....	.....	.....	.....	20	.....	20	

RETURN from the Records of the several elections to the Legislative Assembly in 1893—*Continued.*

Electoral District.	Names and Numbers of Polling Sub-divisions.	Names of Candidates and No. of Votes polled for each.			Votes in each Sub-Division.			Ballot Papers sent out, and how disposed of in each Sub-Division.							Tendered Ballot Papers sent out and how disposed of in each Sub-division.			Population in each Constituency, as shewn by last census
					Total No. of Votes Polled.	No. of Votes remaining Unpolled.	No. of Names on the Voters' List.	No. of Ballot Papers sent out to each Sub-Division.	Used Ballot Papers.	Unused Ballot Papers.	Rejected Ballot Papers.	Spoiled Ballot Papers.	Ballot Papers given to Voters who afterwards declined to vote.	Ballot Papers taken from Polling Places.	No. of tendered Ballots sent out to each Sub-division.	Used.	Unused.	
Toronto—*Con*....	Ward No. 3—*Continued.*	Ryerson.	Ogden.	Thompson														
	64	27	33	2	62	98	160	200	62	138	.....	.....	.....	.....	20	.....	20	28th Feb'y, 1893.
	65	30	40	5	75	75	150	200	75	125	.....	.....	.....	.....	20	.....	20	
	66	33	38	.....	71	94	165	200	71	127	2	.....	.....	.....	20	1	19	
	67	31	37	3	71	117	188	200	71	128	1	.....	.....	.....	20	5	15	
	68	31	46	4	81	94	175	200	81	119	.....	.....	.....	.....	20	1	19	
	69	42	38	3	83	98	181	200	83	116	.....	1	.....	.....	20	1	19	
	70	31	31	5	67	116	183	200	67	133	.....	.....	.....	.....	20	.....	20	
	71	18	24	1	43	95	138	200	43	157	.....	.....	.....	.....	20	.....	20	
	72	19	19	2	40	79	119	200	41	158	.....	1	.....	.....	20	.....	20	
	73	20	29	2	51	80	131	200	41	159	.....	.....	.....	.....	20	.....	20	
	74	17	36	4	57	78	135	200	57	143	.....	.....	.....	.....	20	.....	20	
	75	15	34	.....	49	67	116	200	49	151	.....	.....	.....	.....	20	.....	20	
	Totals	1,393	1,569	127	3,089	4,154	7,243	15,000	3,082	11,907	6	5	.....	....	1,500	24	1,476	
	Majority for Ogden	.....	176															
	Ward No. 4—																	
	1	5	1	.....	6	123	129	200	6	194	.....	.....	.....	.....	20	.....	20	
	2	23	43	2	68	60	128	200	68	132	.....	.....	.....	.....	20	.....	20	
	3	21	32	3	56	61	117	200	56	144	.....	.....	.....	.....	20	1	19	
	4	36	25	5	66	82	148	200	66	134	.....	.....	.....	.....	20	.....	20	
	5	23	18	3	44	88	132	200	44	154	.....	2	.....	.....	20	.....	20	
	6	31	33	2	66	104	170	200	66	134	.....	.....	.....	.....	20	1	19	
	7	29	30	6	65	82	147	200	65	135	.....	.....	.....	.....	20	.....	20	
	8	26	20	7	53	108	161	200	52	147	.....	.....	.....	.....	20	.....	20	
	9	28	21	.....	49	86	135	200	49	150	.....	1	.....	.....	20	1	19	
	10	17	15	1	33	90	123	200	33	167	.....	.....	.....	.....	20	.....	20	
	11	23	30	2	55	91	146	200	55	145	.....	.....	.....	.....	20	.....	20	

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RETURN from the Records of the several Elections to the Legislative Assembly in 1893.—*Continued.*

Electoral District.	Names and Numbers of Polling Sub-Divisions.	Names of Candidates and No. of Votes polled for each.			Voters in each Sub-Division.			Ballot Papers sent out, and how disposed of in each Sub-Division.							Tendered Ballot Papers sent out and how disposed of in each Sub-division.			Population in each Constituency, as shown by last Census.
					Total No. of Votes polled.	No. of Votes remaining unpolled.	No. of Names on the Voters' Lists.	No. of Ballot Papers sent out to each Sub Division.	Used Ballot Papers.	Unused Ballot Papers.	Rejected Ballot Papers.	Spoiled Ballot Papers.	Ballot Papers given to Voters who afterwards declined to vote.	Ballot Papers taken from Polling Places.	No. of tendered Ballots sent out to each Sub-division.	Used.	Unused.	
Toronto—*Con.*...	Ward No. 5—	Ryerson.	Ogden.	Thompson														
	1	14	30	2	46	82	128	200	46	154					20		20	28th Feby. 1893.
	2	11	37	5	53	84	137	200	53	147					20		20	
	3	22	43	3	68	27	95	200	68	132					20		20	
	4	25	29	5	59	85	144	200	59	140		1			20	1	19	
	5	23	23	8	54	76	125	200	55	144	1				20		20	
	6	15	29	9	53	93	146	200	52	148					20		20	
	7	19	37	7	63	73	136	200	63	137					20	1	19	
	8	24	12	3	39	90	129	200	39	160					20		20	
	9	37	30	3	70	65	135	200	70	130					20		20	
	10	35	18	4	57	91	148	200	57	143					20	1	19	
	11	29	33	4	66	82	148	200	66	134					20		20	
	12	29	20	8	57	89	146	200	57	143					20	1	19	
	13	23	30	4	57	102	159	200	54	146					20		20	
	14	22	18	6	46	104	150	200	46	154					20	2	18	
	15	22	24	5	51	77	128	200	51	149					20		20	
	16	20	39	4	63	129	192	200	63	137					20		20	
	17	23	29	2	54	60	114	200	54	146					20		20	
	18	13	31	3	47	78	125	200	47	122		1			20		20	
	19	28	21	7	56	96	152	200	56	144					20		20	
	20	32	25		57	67	124	200	57	143					20	1	19	
	21	28	17		45	86	131	200	45	155					20		20	
	22	26	18		44	76	120	200	44	156					20		20	
	23	33	28	1	62	68	130	200	62	138					20		20	
	24	31	27	3	61	98	159	200	61	139					20	1	19	
	25	31	23	3	57	84	141	200	57	143					20		20	
	26	31	15	4	50	83	133	200	50	150					20		20	
	27	35	26	6	69	80	147	200	69	126	3	2			20		20	
	28	24	17	1	42	85	127	200	42	158					20		20	
	29	32	14	5	51	77	128	200	51	149					20		20	

| | | |

RETURN from the records of the several Elections to the Legislative Assembly in 1893—*Concluded.*

Electoral Districts.	Names and Numbers of Polling Sub-Divisions.	Names of Candidates and No. Votes polled for each.			Voters in each Sub-Division.			Ballot Papers sent out, and how disposed of in each Sub-Division.							Tendered Ballot Papers sent out and how disposed of in each Sub-division.			Population in each Constituency, as shown by last Census.
					Total No. of Votes polled.	No. of Votes remaining unpolled.	No. of Names on the Voters' List.	No. of Ballot Papers sent out to each Sub-Division.	Used Ballot Papers.	Unused Ballot Papers.	Rejected Ballot Papers.	Spoiled Ballot Papers.	Ballot Papers given to Voters who afterwards declined to vote.	Ballot Papers taken from Polling Places.	No. of tendered Ballots sent out to each Sub-Division.	Used.	Unused.	
Tor.—*Con.*	Ward No. 6—*Continued.*	Ryerson.	Ogden.	Thompson														
	28	20	12	.....	32	48	80	200	32	168	.....	.....	.....	.....	20	.....	20	28th Feby, 1893.
	29	10	11	1	22	63	85	200	22	178	.....	.....	.....	.....	20	.....	20	
	30	25	16	2	43	89	132	200	43	157	.....	.....	.....	.....	20	.....	20	
	31	13	19	2	34	85	119	200	34	166	.....	.....	.....	.....	20	2	18	
	32	16	18	.....	34	62	96	200	34	166	.....	.....	.....	.....	20	.....	20	
	33	11	11	.....	22	42	64	200	22	178	.....	.....	.....	.....	20	.....	20	
	34	27	8	.....	35	51	86	200	35	165	.....	.....	.....	.....	20	.....	20	
	35	12	9	.....	21	43	64	200	21	179	.....	.....	.....	.....	20	1	19	
	36	22	13	.....	35	41	76	200	35	165	.....	.....	.....	.....	20	.....	20	
	37	24	21	.....	45	43	88	200	45	155	.....	.....	.....	.....	20	.....	20	
	38	5	6	.....	11	79	90	200	11	189	.....	.....	.....	.....	20	.....	20	
	39	2	1	.....	3	6	9	200	3	197	.....	.....	.....	.....	20	.....	20	
	40	16	4	.....	20	49	69	200	20	180	.....	.....	.....	.....	20	.....	20	
	41	10	5	.....	15	61	76	200	15	185	.....	.....	.....	.....	20	.....	20	
	Totals	872	693	38	1,603	2,799	4,302	8,200	1,603	6,597	.....	.....	.....	.....	820	7	813	
	Majority for Ryerson	179																
	Ward No. 1	1,154	472	73	1,699	.....	3,899	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	181,220
	do 2	1,501	1,466	104	3,071	.....	7,146	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
	do 3	1,393	1,569	127	3,089	.....	7,243	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
	do 4	1,518	1,725	150	3,393	.....	7,811	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
	do 5	1,181	1,104	150	2,435	.....	6,072	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
	do 6	872	693	38	1,603	.....	4,402	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
	Grand totals	7,619	7,029	642	15,290		36,573											
	Total majority for Ryerson	590																

PETER RYAN, Returning Officer for the electoral district of the City of Toronto.

REPORT

OF THE

ONTARIO

GAME AND FISH COMMISSIONERS

FOR THE YEAR

1892.

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY.

TORONTO:
PRINTED BY WARWICK & SONS, 68 & 70 FRONT STREET WEST.
1893.

REPORT

OF THE

ONTARIO GAME AND FISH COMMISSIONERS

His Honor,
The Lieutenant-Governor
of Ontario.

SIR,—Your Commissioners beg herewith to present their first annual report.

Annexed to the report will be found the reports of the Wardens, and other tables and matter which will be found self explanatory and interesting.

Your Commissioners are satisfied that much good has resulted from the establishment of the Commission, and from the efforts put forth by them during the year. Whilst it would be idle to pretend that the wanton slaughter of Game and Fish has been entirely stopped, there is no doubt whatever that it has already been minimized, nor can there be any doubt that the Game Laws as they now stand receive the general support of the sportsmen throughout the Province and the public generally.

The present Board of Game and Fish Commissioners was gazetted as a permanency in the month of June 1892, in consequence of the recommendation of the Commission appointed by the Ontario Government in November, 1890.

It was not, however, until the 27th of July that the members of the Board where called together for organization, so that whatever work has been done during the year, has been accomplished in a very short period of time.

By the amendments to the Game Act passed at the last session of the Ontario Legislature, it is provided that the members of the Board should be appointed by the Lieutenant-Governor in Council for a term of three years each in the following manner viz :

One of the Commissioners to hold office until 1st April, 1893; two to hold office until 1st April, 1894; and two to hold office until 1st April, 1895.

The Commissioners may from time to time at the expiration of their terms of office be re-appointed for a like term of three years.

At the first meeting of the Commissioners, lots were drawn to decide as to the respective terms of office with the following result.

To hold office until 1st April, 1893, Dr. G. A. McCallum, Dunnville.

To hold office until 1st April, 1894, Mr. J. H. Willmott, Beaumaris, Muskoka, and Mr. W. G. Parish, Athens.

To hold office until 1st April, 1895, Mr. W. B. Wells, Chatham, and Mr. H. P. Dwight, Toronto.

The Game and Fishery Acts were fully and carefully discussed at the meeting in question, and it was the unanimous opinion of the Commissioners that an energetic effort

should be made to enforce the laws and to put a stop, as far as possible, to the ruthless and indiscriminate destruction of the Game and Fish of the Province which has well-nigh caused their utter extinction.

The amendments to the Game and Fishery Acts above referred to, were passed at the suggestion of many of the principle sportsmen of the Province and are undoubtedly valuable, inasmuch as they strengthen the old laws and form the beginning of a system of work on which future operations of the Commissioners may be based.

The trouble in past years has been that whilst there was an ample amount of law, there was little or no enforcement, and the laws were broken in consequence, openly and defiantly all the year round, by rich and poor alike without let or hindrance.

Your Commissioners found on commencing their work that the most lamentable ignorance existed in the minds of the public as to what the Game and Fishery Laws really were.

One-half the community was honest when it pleaded ignorance, and the other half was ignorant advisedly, and between them both the Game Laws might as well have never been framed.

The first thing therefore determined upon was the issue of an abstract of the Game and Fishery Laws.

This was printed in large numbers, both in large sizes on cardboard sheets and in small pamphlet form on paper. They contained for the most part the close seasons for Game and Fur-bearing animals, Birds and Fish, and set forth the penalty for violations of the law, besides giving information on such of the more important points in the law as might be reasonably expected would crop up from time to time when the officers appointed to enforce the laws begun their work.

Neither trouble nor expense was spared in the matter of issuing the abstracts and pamphlets here referred to. No fewer than 30,000 copies were printed, and these were issued to all Justices of the Peace, Post-Masters, Custom-House officers, G. T. R. and C. P. R. agents, Canadian and Dominon Express Co. agents, Judges, Police Magistrates, Newspaper Editors, Hotels, and G. N. W. and C. P. R. Telegraph agents in Ontario, to be posted in prominent places.

In addition to these, the Deputy-Wardens each received a parcel of this literature for distribution in their own neighborhoods, and the consequence was that in a very short time, the entire Province was flooded with the notices thus sent out by authority of the Board, and the poachers and pot-hunters awoke to the fact that at last they were likely, to be brought to book for their nefarious practices.

Wardens.

Your Commissioners had power under the amended laws, to appoint four Wardens and at their first meeting the following gentlemen were selected :

Mr. J. H. Willmott, Beaumaris, Muskoka.
Mr. H. K. Smith, Belleville.
Mr. John A. Gill, Dunnville.
Mr. F. C. Quallins, Leamington.

The Wardens thus appointed entered immediately upon their duties, and your Commissioners can testify to the thorough manner in which their work has been done. They have proved themselves to be intelligent, active, and zealous, and without their assistance it would not have been possible to cover as much ground as has been done during the season which has just closed.

The appropriation set apart by the Government for the work of the Commission was so small that nothing in the shape of adequate salaries could be offered to the Wardens, and it will be a surprise to the citizens of the Province when they learn that these officers have given up their time to the work of the Commission, in some cases to

the utter ruin of their private business, for the sum of $10 per month. This they have done, because, being sportsmen at heart and desirous of seeing the good work efficiently carried out, they were willing to sacrifice their time and give their labor almost voluntarily until such time as the work of the Commission could be properly and fully established, but they cannot be expected of course, to continue their work during the coming year unless they are paid such salaries as will enable them to live.

Deputy-Wardens.

Your Commissioners desire to point out that under the present Game Act, it is doubtful whether the Deputy-Wardens have power to open and search boxes, parcels and baggage in which game illegally killed is supposed to be hid, without a search-warrant.

Under the old Act this power was given to Game Inspectors appointed by municipalities, and unless it is made clear that Deputy-Wardens have the same power they will be greatly handicapped in their efforts to enforce the law.

Your Commissioners are also of opinion that they should have the power to appoint and dismiss the Wardens or Deputy-Wardens for cause as occasion may require, but no provision appears to have been made for their so doing under the present Act.

Fish.

Your Commissioners regret that owing to the dispute which has arisen between the Dominion and Ontario Governments in the matter of the Fisheries, they have been unable to do very much in the way of enforcing the Fishery Laws. It has not been thought wise or expedient to do very much under the circumstances and your Commissioners have therefore no report to make in the matter except to express the hope that the present difficulty may be speedily settled upon a satisfactory basis, and that the powers of the Province and of the Board of Commissioners may be clearly and distinctly defined.

There is much good work to be done in the way of re stocking the depleted streams and waters in the Province, and there is much room for improvement in matters appertaining to fish slides, and the destruction of fish by sawdust and other noxious materials. These are matters which cannot too soon be undertaken and pressed to a satisfactory conclusion.

Your Commissioners also desire to point out that there is nothing in the Fisheries' Act to prohibit the sale of fish during the close season "no matter where taken or procured."

For want of such a clause as this, the law is openly violated and it should be amended without delay to cover the point referred to.

Fish Hatcheries.

Your Commissioners desire to point out that many large streams and other waters in the Province are almost completely depleted of fish. From an economic point of view it is to be regretted that these large areas should be allowed to go to waste when by being properly restocked with the better food fishes they might be made to yield an enormous quantity of cheap and wholesome food, not only for the people of Ontario, but for the purpose of exportation.

Your Commissioners therefore unanimously and strongly recommend that a sufficient sum be appropriated without delay, for the purpose of erecting a Provincial fish hatchery, and working the same.

On the recommendation of your Commissioners, the Commissioner of Crown Lands purchased lately from the Dominion Hatcheries 50,000 Trout fry, and these have been placed in two streams in the County of Wentworth, and in two in Brant County. They will be looked after, and if the experiment is found successful a larger number may be distributed next year.

As showing the effect of the propagation of fish, your Commissioners would draw the attention of the Government to the fact that several barrels of yearling Carp with some older ones were taken this spring for the first time in seines in the Grand River below the dam. Two varieties were taken in about equal numbers, viz., Scale Carp and Mirror Carp. These fish were not planted in Lake Erie by the Dominion Fishery Department, therefore they must be the result of the American work, having crossed the lake within a few years and taken possession of the marshy streams on this side congenial to their tastes. They are a very desirable food fish, growing and multiplying rapidly, and your Commissioners have bought several hundreds and transferred them to the Grand River above the dam where there is a large body of water. They also intend planting a number in the Chippewa River.

Last autumn a consignment of Carp fry were received by one of your Commissioners from the Carp Ponds at Washington, D.C., and these too were planted in the Upper Grand River where it is believed they will increase immensely, furnishing in the future a cheap article of food for the residents along the shores of that large river.

International Fish Conference.

The second annual International Fish and Game Conference was held in Detroit Mich., on 20th and 21st Dec., the Ontario Commission being represented by Mr. W. B Wells of Chatham. Important resolutions were passed at this meeting which deserve more than passing attention.

The first conference was held in the City of New York on 12th October, 1891. The object of the meeting being to procure, if possible, uniform legislation affecting the Game and Fish in the Province of Ontario and the American States bordering on the great lakes.

This meeting was suggested by your Commissioners, and as they had addressed letters to the Governors of all the States bordering on the great lakes, asking that delegates be sent to attend the Conference, the idea was pretty generally adopted and not only were representatives in attendence from several States, but the United States Fish Commission sent a special representative also.

At the meeting in New York little was done except to organize, but two important sessions were held afterwards, at Rochester, N. Y., on 10th November 1891, and at Hamilton, Ont., on 8th December, 1891, both of which were largely attended, and at which the subject of reciprocal legislation in the matter of Game and Fish was fully discussed.

The proceedings of these meetings are fully set forth in your Commissioners' report for 1892, and will be found to be full of interest and practical information.

To two matters which are of especial interest, your Commissioners desire to draw special attention as they consider that the credit of keeping them prominently before the notice of the public belongs to the Province of Ontario which they represent.

In the Province of Ontario spring shooting has for some years been illegal, but the practice has unfortunately not yet been abolished in the neighboring States. Much of the bird life which spends its winters in the south is received in Ontario, where it is carefully kept and protected for seven or eight months in the year. In the American States, however, the birds are slaughtered during the spring when pairing, and the Ontario delegates insisted strongly that a change should be made in the laws of the bordering States so that this evil might be checked.

The subject of spring shooting was very carefully considered by the Codification Committee, when the State of New York Game Law was being prepared, and an abolition of the evil was recommended. Such was the pressure however brought to bear against the recommendation by interested parties on Long Island, N. Y., that the proposal was quashed indefinitely.

The true sportsmen of that State as evinced at their memorable gathering in Syracuse, N. Y., in 1892, are almost unanimously in favor of the prohibition of spring shooting, and as the views of the speakers at the late conference in Detroit were all in the same direction, there is still room for hope that the required legislation will be had at no very distant date.

In the matter of a close season for White-Fish, your Commissioners were surprised to learn that no close season existed in American waters. The folly of such a state of things was pointed out by your Commissioners and hopes were expressed that a change would also be made in this direction in order that a restriction might be placed upon extravagant waste. At the Detroit meeting, this matter was again fully discussed and as a result, a resolution, (which was opposed only by a single member,) was passed recommending that the month of November of each year should be made a close season in all the great lakes for White-Fish, Herring, Salmon or Lake Trout.

Thus it will be seen that these Conferences are of great benefit, and your Commissioners are not a little gratified at the fact that to the Province of Ontario belongs the credit of their inauguration.

Game.

The Game Act has been found to work remarkably well, and so far from proving to be a source of irritation, it has had the almost unanimous support of all classes of the community.

The Wardens and Deputy-Wardens have been instructed to use the utmost discretion in cases where settlers or persons who have to depend oftentimes on the Game they kill for the necessities of life have appeared to have violated the laws, and no complaints have reached the Board of cases in which this rule has been departed from.

There has been a noticeable decrease in the number of Deer killed during the open season, and the sight, so common in past years, of Game and Fish being defiantly exposed for sale in the markets throughout the Province during the close season has now become a rarity.

Fawns.

Whilst fully recognizing the importance and advisability of altering and tampering with the law as little as possible, your Commissioners feel it their duty to recommend that the clause prohibiting the killing and sale of fawns should be struck out.

There can be no doubt that sportsmen are often unable to tell the difference between a fawn and a doe or between a fawn and young buck, when taking long or snap-shots, and many fawns have been killed during the season unwittingly by persons who would under no consideration break the law if they could avoid it. The clause has proved to be a constant source of irritation, and added to this is the fact that the Magistrates themselves who are called upon to try these cases are generally unable to determine on the evidence presented to them; this being the case your Commissioners advise that the clause in question be eliminated entirely.

Hares.

Your Commissioners desire to point out that the Game Act establishes a fixed open season of three months commencing on 15th September and ending 15th December in each year, after which no person has any excuse for being found hunting or disturbing Game in its haunts.

Whilst Hares have always been protected for a certain season, one species, the Wood-Hare or "Cotton-tail" has, unfortunately, on account of its resemblance to the English Rabbit been destroyed at all seasons.

It has been accused of being a pest and destructive to crops, etc., but your Commissioners claim that the charge is no more applicable to the little Wood-Hare than to Deer, Quail, or even insectivorous birds, which are either commonly found grazing crops, eating grain, or in the case of the last mentioned, eating the fruit blossom buds in large quantities. Although this be true, no one would suggest that these were pests and in consequence should be exterminated.

Those persons who wish to be able to hunt and kill Game during the whole year make complaint about the "Cotton-tail," and desire to be allowed to hunt it after 15th December. Your Commissioners, however, are of opinion that the protection of this Hare should be continued inasmuch as boys and others who pretend to shoot only this animal really disturb and destroy other Game which is sure to be found on the same grounds.

Your Commissioners desire strongly to express their approval of having a fixed close season for all Game as tending to its preservation and lessening the expense of seeing that the Game Act is properly observed. If in spite of these recommendations, it is deemed unwise to continue the protection of the Wood-Hare or "Cotton-tail," your Commissioners would recommend that Hares should be allowed to be shot during the common open season up to 15th December in each year, but after that, for a month or even up to 28th February Wood-Hares or "Cotton-tails" should be allowed to be taken only by other means than by shooting.

Your Commissioners further recommend that a clause be added to the Game Act, providing that the Wood-Hare may be killed at sight if found damaging fruit trees or otherwise destroying property.

Fur-Bearing Animals.

Strong objection has been taken by the Hudson Bay Company against the clause in the Game Act protecting Beaver and Otter. The ground taken by the Company is that whereas these animals may be scarce in the central portions of Ontario, they are still abundant in the portions of the Province where the Company does business, but your Commissioners cannot see their way to recommending special legislation in this matter without very careful enquiry, which they so far have not had an opportunity of making.

Musk-Rats.

In view of the fact that during the autumn and early winter months a large proportion of the Musk-Rats taken are but kittens and not fit for market, your Commissioners are of the opinion that the season should be so altered as to allow of the pelts being only taken when the fur is prime and in good condition.

They therefore recommend that the close season for Musk-Rats should extend from May 1st to January 1st following, instead of as at present from April 1st to November 1st, and that owing to the fact that the skins are of but little value when the animal has been shot, and that during the month of April when this sort of hunting is chiefly pursued the ducks which frequent our marshes are just arriving, the shooting of musk-rats should not be allowed during April, because it is principally done before sunrise and after sunset, and it tends to disturb and drive the waterfowl from their feeding and breeding ground.

Your Commissioners believe, however, that trapping, etc., of Musk-Rats may be allowed during April without prejudice.

Foxes.

Your Commissioners recommend that a bounty of $1.00 per head be paid for the destruction of full-grown Foxes, and 50 cents per head for young ones.

Partridge and Quail.

The law forbidding the sale of these birds has been well observed, and has proved highly popular with those who are anxious to see the markets closed against the pot-hunters who have been shooting off all the game in the country for years past.

A *cause celebre* during the season was that in which a Toronto game dealer was fined by the Police Magistrate for exposing Quail for sale. The dealer appealed from the Magistrate's decision, arguing that the birds had not been shot in Ontario, and that the law which prevented the sale of the Quail, "no matter where procured," was bad, inasmuch as it had a tendency to restrict trade.

The appeal was heard before Judge Rose, who sustained the Magistrate's decision, and the game dealers were thus taught that the laws must be obeyed to the letter.

Ducks.

Your Commissioners recommend that the clause in the Game Act which provides that no person shall take or kill more than three hundred Ducks during one season should be repealed, for the simple reason that it cannot be enforced.

No officer can possibly tell how many Ducks any one man may shoot during the season, and your Commissioners do not think that the Game Act should contain a single clause which cannot be actively enforced.

Insectivorous Birds.

Your Commissioners regret that the slaughter of insectivorous birds and the collection of their eggs is still continued under the disguise of permits issued for so-called "scientific purposes," and are unanimously of opinion that a stop should be put to this crying evil. Your Commissioners recommend, with this object in view, that the issue of such permits should in future be entrusted to them instead of to the Department of the Minister of Agriculture.

Consolidation of Game and Fisheries' Acts.

Your Commissioners are of opinion that the Game and Fishery Laws should be consolidated without delay, as much difficulty is at present experienced in referring to the laws which are spread over many original and amended Statutes and Orders in Council.

Digests.

A very complete Digest of the Game and Fishery Laws was prepared during the year by Mr. A. H. O'Brien, Barrister at Law, Toronto. This little work has been most carefully compiled, and is a synopsis of the whole law so far as it relates to the animals, birds and fish protected by it.

Your Commissioners strongly recommend that a supply of these Digests be procured and that each of the Wardens and Deputy-Wardens be supplied with a copy, so that they may, by reference to the work, tell at a glance what the law is and where to find it.

Masked Hunters.

Complaints have reached your Commissioners during the year on the subject of masked hunters. There seems to be no necessity nowadays for men to go hunting with masks on, and the man who goes about armed, with his face concealed, is presumably not an honest citizen.

Your Commissioners recommend therefore that a law should be passed providing for the punishment of any person found guilty of such an offence.

Foreign Sportsmen.

Your Commissioners desire to point out that under the present law foreign sportsmen are obliged to take out licenses before they can hunt or take any of the animals described in the Game Act, but they are not required to take out licenses to hunt or take animals not specified therein. In the opinion of your Commissioners this is clearly wrong, and the law should be amended so as to make it compulsory for all foreign sportsmen who shoot or hunt in Ontario to take out licenses no matter what species of bird or animal they are in quest of.

Permits.

Your Commissoners are of opinion that the power given to Wardens to issue permits should be revoked, and that no permits of any sort should be issued to foreign sportsmen to hunt in the Province unless under very special circumstances.

Departmental Bureau.

Your Commissioners desire to say that the question of protection and propagation of the Game and Fish of the Province is one of serious moment, and the work should not be entered upon in a half-hearted way.

Your Commissioners are unanimously of opinion that a department in the Parliament Buildings should be devoted to the use of the Board, where all documents, specimens, etc., appertaining to the Game and Fish Commission could be securely kept. With such an arrangement, the Commissioners would be always within reach of the Ministers under whose directions the Game and Fishery Laws properly come, and much valuable time would be saved when replying to important communications or considering intricate questions.

Appropriation.

Your Commissioners, in concluding their report, respectfully recommend that an appropriation of not less than $10,000 be placed at their disposal in order that they may be able to carry out their work completely and satisfactorily during the coming year.

With such an appropriation as this, much good work can be done, whereas with a meagre sum at their disposal the work required of your Commissioners cannot be overtaken, and the laws which, in the public interest, ought to be enforced, and which, if enforced, will be of lasting benefit to the Province, must remain as they have remained for years, a dead-letter in the Statute books.

Your Commissioners unanimously recommend that the appropriation voted during the coming session of the Legislature be placed to the credit of the Board in a recognized bank, so that the time now lost in araanging for payments of salaries, travelling expenses, etc., may be saved.

All of which is respectfully submitted.

G. A. MacCALLUM,
Chairman,
Ontario Game and Fish Commission.

Dunnville, 31st December, 1892.

REPORT OF CHIEF WARDEN.

HAMILTON, ONT.,
31st Dec., 1892

G. A. MacCallum, Esq., M.D.
Chairman,
Ontario Game and Fish Commission.

SIR.—I beg herewith to submit a summary of the work of the Department for the season of 1892.

As the work may be said to have just commenced and the system is as yet incomplete, I am unable to present as full a report as I could have wished, but I have no hesitation in saying that from observations made personally in all parts of the Province, I believe the Game Laws to be generally popular, whilst the clauses they contain have been as far as possible enforced vigorously, without partiality or favour.

My duties have consisted so far, for the most part in answering and attending to the enormous volume of correspondence which has poured in steadily upon me ever since the Commission was organized, and although I have made frequent trips to various parts of the Province to assist in the prosecution of cases where the Deputy-Wardens were experiencing difficulty in their work, most of my time has been spent in my office. Notwithstanding this, however, to such large proportions has the work of correspondence grown, that much of it has been but partially attended to, whilst no time whatever has been found for fyling or indexing the letters and papers received, a matter which ought to be overtaken as soon as possible.

I have been expected to give a portion only of my time to the work of the Commission, but as a matter of fact it has occupied my entire attention. I am convinced that no one man can overtake the work single-handed if it is to be done properly, and a clerk or assistant for office work is an absolute necessity.

ARRESTS.

For want of accurate information, and owing to the want of a proper system for learning these particulars, I am unable to say exactly how many cases have been handled by the Department during the season. A table will be found however, annexed to this report setting out such cases as I have knowledge of, and I trust that during the coming year an arrangement can be made whereby the work of the Deputy-Wardens can be reported promptly, although I find it hard to get answers from some of these officers no matter how often they are written to, or how important the subjects upon which information is desired.

WARDENS.

The manner in which the duties of the four Wardens have been performed during the season has been perfectly satisfactory, and I am glad of the opportunity to say publicly, that but for their earnestness and zealous assistance, little good would have been accomplished.

I beg to point out on behalf of these officers that owing to the smallness of the appropriation set apart by the Government for the use of the Commission, the Wardens have been working for the sum of $10 per month. This rate of remuneration must of course be largely increased during the coming year if the services of these officers are to be retained, and it is obvious that unless the Wardens are in a position to give their entire time to the work they may as well not be employed at all.

Annexed to this report will be found reports from the Wardens which speak for themselves and which will I trust be found satisfactory.

Deputy-Wardens.

I was requested by the Board at its first meeting to have a force of Deputy-Wardens appointed throughout the Province without delay.

No provision is made for a salary to these officers, but they are entitled to receive half the fines following convictions.

I at once drew up a circular which I sent to County Judges, Police Magistrates, Gun-clubs, County Wardens and other prominent persons who were likely to be interested in the work of the Commission, asking them to recommend the names of persons who were willing to act as Deputy-Wardens upon the conditions above set forth.

Many replies were received to my circular, and as a result thereof 392 deputies have been appointed. The names and address of these officers will be found annexed to this report.

The Deputy-Wardens are each provided with a badge of office, and instructed to keep sharp lookout for violations of the Game Laws in their own immediate neighborhood. As no salary is attached to the office much difficulty has been experienced in getting good men to act, and there is no doubt that while some excellent appointments have been made many undesirable ones have also been made.

Although as the official head of the Deputy-Wardens I should know each of them personally, I may say that I know only some half-dozen of the men and have had no opportunity therefore of judging of their qualifications or fitness for office. From some of the deputies I get prompt replies to such communications as I have occasion to send them; from others I never hear at all. Some have made an honest effort to enforce the laws whilst others appear to have done absolutely nothing.

I find too that many of the Deputies are handicapped in their efforts when they bring cases into court, because, being utterly unfamiliar with court proceedings they are unable to prosecute their own cases, and it is generally only necessary for the defendants to employ counsel to secure an acquittal even in cases where convictions should be an absolute certainty.

I find the Deputies unwilling to prosecute cases also, because the law makes no provision for the payment of costs in cases where they are unsuccessful, and they argue, not illogically, that they should hardly be expected to work without remuneration and then be required to pay the costs in cases, which, although perfectly clear, have been dismissed on account of some technicality or through their own inability to prosecute properly.

There is no doubt that the Deputy-Wardens should be periodically visited by the Chief Warden, who should know the men and the localities in which they are supposed to be doing work. The list should be carefully revised; the good and willing workers being retained and the inefficient ones dropped, and I hope that this course will be pursued during the coming year

I have to point out that there is room for doubt as to whether the Deputy-Wardens have power under the Act to search baggage and parcels. I am inclined to think that they have no such power, although this was not intended when the Act was passed.

Under the old Act, municipalities were empowered to appoint Game Inspectors, and these officers were empowered to search parcels, boxes, and baggage in which they supposed game was being illegally concealed. This power should certainly be given to Wardens and Deputy-Wardens, as unless these officers have the authority thus to act, their hands must necessarily be seriously tied. An officer who comes upon an offender in the woods cannot possibly procure a search warrant without going to the nearest town or settlement to procure one, and by the time he returns the offender has of course made good his escape. This is a matter which I think should receive the attention of the Government during the coming session when I hope to see the law amended as I suggest.

Game and Fishery Acts.

Referring to the Game and Fishery Acts, I think I am justified in saying that they have been almost universally approved of. There is yet room in both, perhaps, for improvement, but inasmuch as they provide for a system whereby the laws can be made effective; and as they have been framed with a view of protecting and thereby

increasing the Game and Fish of the Province, they have received the support of all right-thinking people. There are points upon which sportsmen themselves differ, but taken as a whole there can be no doubt that the present laws are good and satisfactory and that they are generally endorsed throughout the Province.

Not only is this the case, but there is no manner of doubt that the Game and Fish have been protected during the past season as they never have been protected before in the history of Ontario.

The reports which I have received from sportsmen themselves, from officers of the various gun clubs in the Province, from guides, trappers, hunters, and railway and express agents lead me to believe beyond any peradventure that not one-quarter of the game has been killed this year as compared with former seasons.

This is a state of affairs upon which the Commission can well congratulate itself, and even those who have grumbled this year at the restrictions which have been put on the slaughter of former years will find next season that game of all sorts will probably be more plentiful and that the Province will be a distinct gainer by the vigorous enforcement of the laws.

I am pleased to be able to say further that the laws appear to be popular amongst settlers and persons living in unorganized districts, upon whom it was feared at first that the laws might bear very heavily. A wise provision contained in the Acts whereby these settlers where given power to kill game at all seasons for there own immediate use and for the reasonable necessities of their families, has perfectly satisfied them, and I think I may say that the settlers themselves are amongst the warmest supporters of the laws.

Fish.

I regret to say that owing to the dispute in the matter of the Fisheries at present existing between the Dominion and Ontario Governments very little has been attempted in the way of fish protection or propagation. So unsatisfactory is the present state of things that I have deemed it best to remain almost inactive, and I have no report therefore to make on this subject except to express the hope that the matter may be settled one way or another at an early date so that we may know just what our powers are and what we may or may not do.

Trout Hatcheries.

I issued during the season with the authority of the Board, three permits to owners of private Trout Hatcheries to take trout for the purpose of collecting eggs. These permits were issued to

William Rowbotham, Redickville.
G. A. Lacy, Hillsburg.
John Davis, Alton.

and reports from these gentlemen as to the result of their operations will be found annexed to this report.

Sale of Fish.

I beg to point out that there is nothing in the Fisheries' Act to prohibit the sale of fish during the close season "no matter where killed or procured."

For want of such a clause as this, the law is openly violated and I think that it cannot be amended too soon.

Shooting Licenses.

I have to report that fifty-six shooting licenses were issued to foreign sportsmen during the season at $25 each, making a total revenue of $1,400.

This does not mean, I fear, that only fifty-six foreigners shot in Ontario, but it shows what might be expected under a perfect system (which we certainly have not had during the year.) and I have no reason to doubt, that with better facilities next year in the way of paid Wardens who can give their entire time to the work, this sum can be very largely increased.

A list of the persons to whom these licenses were issued will be found annexed to this report.

Prosecutions.

I beg to point out that, whereas, under the Fisheries' Act, three months are allowed after the commission of an offence in which information may be laid, only two months are allowed under the Game Act, and as longer time is frequently needed in which to hunt up evidence and prepare cases, I strongly urge that three months be allowed for this purpose instead of two.

Abstracts.

No fewer than 20,000 large posters and 10,000 pamphlets containing an abstract of the Game and Fishery Laws have been distributed throughout the Province during the season. These have been found to be very useful and have undoubtedly filled a long-felt want.

I may say here that the abstracts were drawn up by me personally. They were gotten up hurriedly to fill the requirements of the hour, and if they are not as full as they might have been, or if errors have crept into them, mine alone is the fault.

Digests.

A very complete Digest of the Game and Fishery Laws has been published lately by Mr. A. H. O'Brien, Barrister-at-law, Toronto.

This little work is specially adapted for the use of the Wardens and Deputy-Wardens, and I think that each of these officers should be supplied with a copy at the earliest possible moment.

I have the honor to be Sir,

Your obedient servant,

A. D. STEWART,
Secretary and Chief Warden.

REPORTS OF WARDENS.

A. D. Stewart, Esq.,
Secretary and Chief Warden,
Game and Fish Commission.

Belleville, Ont., 31st December, 1892.

Sir,—I have the honor to submit the following report of my work as one of your Wardens for the past year.

For several weeks following my appointment, my time was mainly devoted to corresponding with leading men in various localities, with a view of getting them to nominate reliable men to act as Deputy-Wardens.

This, however, did not prove very satisfactory, as very often the reply was, that it was impossible to get men on whom they could rely to accept the position, on account of there being no salary attached : on the other hand some of my correspondents submitted names for appointment, which I forwarded to you together with the names of the parties by whom they were recommended.

With regard to the shooting of Game Birds prior to the opening of the season, I have not found that there was any shooting of Ducks, but some complaints were made of boys shooting Plover around the shores of the Bay of Quinte. I could not, however, obtain sufficient evidence on which to prosecute.

The regulations with regard to the shooting of Wild Fowl, I believe, have been well observed, with the exception of the clause respecting shooting after sunset. Considerable difficulty has been experienced by the Deputy-Wardens in putting a stop to this practice, as it is next to impossible to detect the culprit in the dark, and it has been suggested, that if it were possible, a regulation should be made prohibiting shooters to be out in the marshes with their boats after sundown. In that case offenders could be identified on their arrival at the landing places.

The regulations in regard to Partridge have been remarkably well observed, no breach of the law having come within my personal observation. I may say, however, that a marked copy of a newspaper was sent me some three or four weeks after its publication, in which it was stated that large quantities of Partridge were being shipped in boxes and barrels from the neighborhood of Sharbot Lake to Brockville and Morristown. Owing to the opening of the season for Deer, I was unable to make any inquiries as to the truth of the statement. On the whole, the regulations respecting Partridge have had a very beneficial effect, as the birds are plentiful in many localities, and I have reason to believe, if the seasons are at all favorable for the hatching of the young, that in a couple of years, birds will be quite numerous wherever there is cover to be found.

Regarding the hunting of Deer, the season proved rather unfavorable for the sportsmen, and that, together with the amendments of the laws, which came into force this year for the first time, has made it quite apparent that not more than half the number have been taken this season as compared with former years. It is reported on all hands that Deer are quite numerous in the various localities frequented by hunters, showing that they have not been disturbed to anything like the same extent as in previous seasons. It does not appear that hunting parties, as a rule, have killed or taken more than the number allowed by law. Violations of the Act, however, have been of frequent occurence, chiefly by the killing of Fawns and shooting on the Lord's Day.

The clause prohibiting the killing of Fawns has proven to be a very vexatious one, and, I think, should be replaced altogether or amended in such a way as to render it easier to obtain a conviction. As it now stands, it is impossible to convict, unless the witnesses for the prosecution have made an expert examination of the animal, and that can rarely be done. Experience has taught me that nine out of every ten cases can be successfully defended, unless such expert testimony is forthcoming.

During the season, and whenever an opportunity occurred, I made careful inquiries respecting the Fish in our northern waters, and if we are to believe the settlers it is apparent that in many of the lakes the Salmon-Trout are steadily diminishing in numbers. As to the probable cause of this, I am not prepared to make a statement, although it has been suggested that a cause may be found in the fact that the coarser fish, such as Suckers and Bull-Heads, are as steadily on the increase in the same waters, and, I think, that the depletion of these waters is due to some such cause rather than to excessive fishing.

I may say in connection with the subject of Fish that the settlers invariably express the wish that the Government would take some steps towards the restocking of the waters. Further, I may say that although the fishing does not appear to have been excessive, it does appear that a good deal of illegal fishing has been done, and I have obtained a number of convictions for offences of this kind.

I may say that the guardianship of the inland waters is not as satisfactory as I could wish; it happens that many of the lakes on which these illegal practices are indulged in are considerable distances away from settlements and consequently beyond the immediate supervision of any of our Deputies. A satisfactory arrangement might be made with assistance from the Department of Crown Lands, whereby these men could be paid for their services.

I understand there is an arrangement between that Department and the lumbermen, by which each pays so much toward the pay of Fire-Wardens. The lumbermen, however, control the appointment, and, naturally enough, appoint friends of their own to watch their depots where their sleighs and other effects are stored. These Fire-Wardens are supposed to be Deputies under the Act, but, as a matter of fact, they take no interest in the matter, and I believe many of them are little better than Fish pirates themselves.

Now, if the Department of Crown Lands would reverse the order of things and select the Fire-Wardens from amongst the number of our Deputies, the pay attached to the position would enable them to devote their time to a very great extent to the necessities of the service, while it would not in any way interfere with their duties as Fire-Wardens.

I would suggest that special efforts ought to be made for the better protection of Fish in those waters known as the Rideau Lakes; these are the great fishing grounds of our American visitors, and unless a stop be put to the annual slaughter of Black Bass by this class of sportsmen, Bass fishing in the Rideau Lakes will soon be a thing of the past.

I have no hesitation in recommending that a $5 license fee should be at once imposed on Americans or any other foreign anglers; that this is the proper course to pursue is the universal opinion of the people in this part of the country.

I have the honor to be, sir,

Your obedient servant,

H. K. SMITH,
Game and Fish Warden.

A. D. Stewart, Esq.,
Chief Warden, Hamilton,
Fish and Game Commission.

Beaumaris, Muskoka, 19th Dec., 1892.

Dear Sir,—I have the honor of transmitting to you my first annual report in respect to the Fish and Game in the northern portion of this Province.

The new laws are as a rule highly thought of by the settlers, and are on all sides admitted to be the best Game Laws which have yet been framed in the Province. The one exception they take is to the running of dogs, which the majority decidedly object to. This mode of hunting is principally practised by outside sportsmen.

The laws have been well observed, and the prosecutions for infractions have been comparatively few, those which occurred will have a most salutary effect on hunters in the future.

The number of hunters who have participated in the sport of Deer hunting has been unusually large this fall, possibly so from the fact that most came up about the same time owing to the shortening of the season, but the number of Deer taken out has been small compared with past years.

The very rough weather, combined with the shortening of the open season, has proved a further source of protection to the Deer. I estimate that on the whole not one-half the number have been shipped out as compared to other seasons. On one line of lake steamers count was kept of the number of Deer conveyed by them, and the result was fully fifty per cent. less than on former occasions, and I believe this would be an indication as to the number conveyed by all routes.

The Deer are more plentiful in the townships bordering on the back country than they have been for years.

Partridges have been very scarce and the new regulation prohibiting the sale of these birds has just come into operation in time.

With regard to Fish, the unsettled question between the Dominion and Provincial Governments, as to which has the jurisdiction over the inland waters, proves a great stumbling-block to the Overseers, as several parties who have been prosecuted for infringments under the Provincial Laws have appealed to the Courts on the grounds that the Province has no right to interfere in what appeared to them Dominion matters, and have thus caused quite an amount of trouble. Until this question is settled I fear no really satisfactory work will be done.

Netting and spearing on the spawning beds is not carried on to such an extent as in years gone by, still cases occur, notably on Trading Lake, where to secure convictions it would necessitate the presence of a Warden during the entire spawning season.

I would call your attention to the present close season of the Salmon-Trout, viz.: from the 1st to the 30th November. This fish is on the beds by the 10th October as a rule, and the spawning is almost over by the 1st November—the date on which the close season commences.

I have experienced a great deal of trouble in getting persons to consent to act as Deputy-Wardens, and have consequently had to recommend several who, under other circumstances, could have been improved on.

I am, Sir,

Your obedient servant,

JOHN H. WILLMOTT,
Game and Fish Warden.

To A. D. STEWART, ESQ.,
Secretary Game and Fish Commission. DUNNVILLE, 26th Jan., 1893.

SIR,—I beg to submit a report of my work during the season just closed.

Immediately on receiving my appointment, I went over the local Game and Fishing grounds, and consulted with every person whom I knew to be more or less acquainted with the Game questions. I found them generally agreed that the Game should have been protected long ago, and the Act to amend the Act for the protection of Game and Fur-bearing animals, also the practical means enacted to put the same in force, was thought by them to be a move in the right direction. It is a well-known fact that our native Game birds have been rapidly decreasing of late years, especially the Partridge and Quail which could at one time be found on every farm in this portion of Ontario.

I think the present Game Laws have had a telling effect on the protection of such Game, for responsible people have so informed me wherever I have gone in search of evidence. Many hunters think the Partridge has become almost extinct in this locality. I have heard of very few having been taken in this vicinity this season. Duck shooting along the Grand River before sunrise was attempted and actually occured in a few instances, but the fear of the law stopped many and others being fully in accord with the law, waited until the legal time for their favorite sport. Sunday shooting and fishing has almost entirely been stopped. It used to be very common along the Grand River and the shores of Lake Erie in this vicinity.

I have carefully posted all bills sent to me and circulated all copies of the Game and Fish Laws that I received, and I have instructed every one who desired to assist in enforcing the law.

I have spent considerable time in travelling about enforcing the law, and I found that I had often to be on the ground between three and four o'clock in the morning in certain places and localities where I was not expected to appear by the shooters; by so doing I caught some in the act, but they agreed not to break the law again, and I believe they kept their word in regard to early and late shooting.

Some of the Deputy-Wardens in this locality have rendered fairly good service but some of them I think are worthless.

The close season for Musk-Rats in this section should be, I think, from the first of May until the first of March the following year; as it is, now, the hunters trap and spear all the young and half-grown kittens in the first part of the season, and also destroy a great number of the rat houses; thus the rats have but a slim chance of reproduction for another year.

I have not yet been able to visit all the sections in this district, but I hope to get over the ground in time.

The American shooters who came to this district during the season were few in number, and those who did come contented themselves with fishing for a day or two or with hiring a guide to go shooting with his dog and gun, while the visitors would carry the game bag and pick up the game shot. All the Americans that I saw, objected to take out licences for a year and tried hard to get permits but were refused.

In regard to the Fish, I hardly know what to say, as I have not given the fish much attention thus far, because the Dominion Officials claim all the over-sight in this vicinity, and I hardly know as yet whether there are any waters containing fish that come under my authority or not.

Dr. McCallum of this village, at his own expense, placed several hundred Carp Fry in the Grand River above Dunnville this season, and there are many who think that the Government should do something in that line also, for the opinion strongly prevails that our inland waters contain much fewer Game Fish than they did in the days of twenty years ago when every boy could capture a good-sized string of fish in an hour or two, while now it beats some of our best experts to catch a dozen or so in a whole day.

Everything connected with fishing, at or near the mouth of the Grand River, goes to show that all gill, pound, or other net fishing, should be regulated so as to allow the fish to come into the mouth of the river to spawn, and ascend the fish slide into the upper river, which lacks many fish that used to be quite common in the upper waters of this

fine river; and also many fish are wasted on account of the very small craft used in hauling the nets ashore; for in case of rough weather the men cannot go out to get their nets and then it often occurs that the nets have to be left out three or four days longer than at first intended, on account of bad weather, and when brought in the most, if not all the catch is rotten, and has to be cast off and buried, thus wasting great quantities of fish.

The opinion is widely spread that fish is becoming a very valuable part of our food supply, and that it will soon be much more valued for dietetic variety, and healthfulness alone, apart from its sport value.

I feel that this report is not nearly so well and fully written as I had intended it should be, but trust it may meet with your approval.

I have the honor to be, Dear Sir,

Yours very respectfully,

JOHN A. GILL,
Game and Fish Warden.

A. D. Stewart, Esq.,
Chief Warden.

Leamington, January, 25th, 1893.

Sir,—I hereby submit a report, regarding my duties and observations during my term of office, commencing the 1st of September, 1892, up to 1st January, 1893.

The protection of the frontiers on which I have been working, is very important, as the western district is differently situated from any other part of our Province, and therefore more difficulty is experienced in enforcing the dignity of the law, regarding the protection of Fish and Game.

From within two miles of the town of Amherstburg to Port Lambton, a distance about forty miles, we have a splendid hunting ground for Ducks, and American and other foreign sportsmen are constantly poaching on it along the whole line.

It is almost impossible to capture the violaters under the present circumstances within the district I have mentioned. There are at least three places of importance, on the American side directly facing Canada, these being the City of Wyandotte, facing the Anderdon Marsh; the City of Detroit opposite Windsor; and the City of Port Huron opposite Sarnia; besides little villages too numerous to mention.

The poaching never ceases, the Americans having no close season in spring time. Time after time I have been disappointed in endeavoring to make arrests, both for Sunday shooting and poaching by foreigners, simply because we could not compete in speed with the offenders who generally have fast sail, or steam yachts, and return to American waters before they can be arrested. These do more harm than the ordinary hunter, as they have swivel guns attached to their boats using a half-pound of powder to about two pounds of shot to a load, and often killing from fifteen to twenty Ducks at one shot. They have also strong field glasses, and can sight a man for a very long distance.

Requests have reached me from many quarters to stop Sunday shooting, but I might as well try to stop the sun, as I am powerless to do so without some suitable craft, it is no small matter to row fifteen to eighteen miles with a row-boat and then find the hunters gone when you reach there. I would recommend that the Government should obtain a steam launch, and patrol the Detroit River from Amherstburg up to the St. Clair Flats to Port Lambton, at least eight months of the year, and good results would come from doing so, more revenue to the Government and more arrests for Sunday shooting and poaching. It would not be very expensive to run, as one good man besides myself could manage it satisfactorily and extra help can be secured at any time.

A little house should be built on Turkey Island, cost about $150, for watchman in case of storm at night, as it lies opposite Wyandotte within one and a half miles of all important hunting grounds, including the Anderdon shooting grounds, surrounded by the channels in Canadian waters, from which we could speedly be on hand when necessary

While travelling over the counties in my district I found that different plans are resorted to to get rid of paying the license. Some foreigners come over without guns and get them from their friends in Canada, and pass themselves off for Canadian citizens, others will take out license, and transfer them to their friends when not using them themselves.

I would strongly recommend that every Warden should have power to examine the club books to ascertain how many foreigners belong to each club in his district. I have a book containing the names and addresses of the Anderdon Gun Club, 34 Americans and 9 Canadians, but I should have access to the books of all other sporting clubs, then I would know who of them have taken out licenses.

There are many sporting clubs on Mitchel's Bay and St. Clair Flats, and a visit should be made there at least once a year, and in this case a steam launch would be of great service.

It is difficult for the Warden to tell Americans who pass themselves as Canadians. The licenses to be issued this coming season they should show the address and full name of the owner, and a clause should be added to the Game Act providing for a $25 to $50 fine or three months' imprisonment for transferring them to any other person; there would not then be so many Americans hunting on Canadian soil without a license.

Quail have been plentiful in some localities, while in others they were scarce. Many reasons are given, but in the County of Essex early birds were destroyed and drowned owing to the wet spring, and the second hatching was not fit to shoot when hunting began, as many birds were only as large Black Birds. A great many sportsmen would like to have the season changed to a later date.

Partridge were not so plentiful and a great many fell prey to the fox and skunks. A Provincial Law should be passed providing for a bounty on foxes instead of leaving it to the local Councils, who are often indifferent to such by-laws.

I find Kent County has some of the best hunting grounds in the Province, and great credit is due to local sportsmen for the way they feed and protect Quail and Partridge. Wild Turkeys are still to be found in some places. Something should be done to encourage the extermination of Wild Cats, which are quite plentiful between Bothwell and Newberry, in a swamp five miles in length and three to four in width. Almost every winter some of these animals are killed, and a bounty of $10, the same as is paid for Wolves, would induce hunters to make a business of killing them.

Ducks are still plentiful and can be seen by the hundreds every Spring and Fall at Rondeau and all along the line from Anderdon to the St. Clair Flats. Excellent shooting is obtained at Mitchel's Bay. The best grounds are not for the public, but are owned by the sporting clubs.

I have heard much complaint regarding the Rabbit season. Most sportsmen claim that the Cotton Tail is the Michigan Rabbit which migrated to Canada at the time of the Michigan fires via Walpole Island, as the river between the United States and Canada is narrow there, while English sportsmen say they were imported from the Old Country directly, and claim they are not the Leslie Hare. Farmers kill them right along all over the country, and some of them who have no guns invite their friends to kill them, as they are injurious to the peach and apple orchards. I have visited some orchards and think there is proof that these claims are true. Some use wire netting for protection, which makes it expensive. Farmers in general should adopt the Australian motto by soaking any kind of cloth or cotton rags in blood, easily obtained at the slaughter houses, and wrap it around the trees. The Rabbits will then never bother them.

The farmers are generally friends to the Quail and Partridge, and prohibit boys and pot-hunters shooting game out of season.

A few men in each township make it a business to kill Foxes, but are generally men above reproach and well known to sporting men.

The Fish question has not as yet received as much attention by me as it should, on account of my having been busy looking after poachers, but from general observation the law is well obeyed by Canadian fishermen. But the American Fish Commission should act in conjunction with the Canadians, and recommend to their respective Government laws of an International character for the protection of Fish.

I am, yours respectfully,

F. C. QUALLINS,
Game and Fish Warden.

Report of Special Patrol made by C. N. Chapman, Deputy-Warden, of Huntsville, Muskoka.

To A. D. Stewart, Esq.,
Chief Warden.

Sir,—On the morning of Friday, November 4th, at 5.15 a.m., I got into my canoe and came east up north shores of Fairy and Peninsula Lakes, landing at foot of Copland's Bay, and struck north up town line between Chaffey and Sinclair to Nere Cut and Jerry's Lakes, and found one hunting party of five. They had killed no Deer at all. Came north east to East River and made wigwam of blanket and poles, and camped for night; it has been snowing all day. Distance 14 miles.

Saturday, November 5th. Pushed on up river to crossing-place; water too high; went on up to still water and built a raft and crossed. Found that some ill-disposed person had set fire to my log shanty and burnt it and its contents, owing to my holding office of Deputy-Warden; heard 3 hounds and saw party of men *en route* for their camp. No violations. Distance 8 miles.

Sunday, November 6th. Was on the move all day: visited four camps, two on river, one on Raft Lake Creek and one at Big Rock. Heard no shots nor hounds to-day.

Monday, November 7th. I tramped up north bank to Raft Lake to see Coulter's party. No Deer: don't water well this season owing to too much water in the woods. On returning I fell in with eight men from Huntsville, camped in old lumber shanty at mouth of Rebecca Creek. They had no luck yet. Heavy rain all day. 13 miles.

Tuesday, November 8th. Crossed river and walked to Sand and Rebecca Lakes. Found six hunters; no violations; rain. Distance 15 miles.

Wednesday, November 9th. Went north-east to Distress Rapids and saw Myer's party of eight. They have three bucks. Came to Boundary Lake, thence south to camp. Beautiful day. Distance 21 miles.

Thursday, November 10th. Came south-west down north bank of river 5 miles, thence over Bailey's Bridge south-east to Harp Lake, thence to Copland's Bay, and to Huntsville *via* south shore of Fairy Lake. Visited four camps and found all right. Awful cold north wind. Distance 23 miles.

Friday, November 11th. Went north to Con. 4, Chaffey, and east and south to Little Lake. Came on camp; men out hunting, five in number: they had two Does and one Buck; thence south to canal and into Township of Brunel to Weed Lake and home. Distance 18½ miles.

Saturday, November 12th. Went west up shore of Vernon Lake to Raven's Cliff, thence on to Hoodstown. Came on four men waiting for hounds on runway which crossed my trail. They said they had only three deer at their camp. I doubted them and went to see for myself, but found they spoke the truth. I returned by old road. Wet day. Distance 18 miles.

Monday, November, 14th. I boarded the steamer Erastus Wiman and went to the portage between Trading and Peninsula Lakes over which all parties must come to connect with the railway. Four parties crossed to-day, they had five big Deer, but no Fawns. I opened two boxes, much to their disgust, thinking they might contain Fawns or Partridge, but they did not.

Tuesday, November 15th. I kept a sharp lookout here all day. Two parties came to take the boat with Deer. No violations.

I will keep an open eye for any venison on and after the 20th November, and if I have the good fortune to catch any violator, he shall receive his dues to the utmost rigor of the law.

I have the honor to be,
Your obedient servant,
CHARLES N. CHAPMAN,
Deputy-Warden.

Report of Special Patrol by Deputy-Warden Chas. N. Chapman through Townships of Finlayson, McCraney, and Butt.

To A. D. Stewart,
Chief Warden.

Tuesday, Jan. 10th, 1893. I left Huntsville at 4.30 a.m. with an Indian sleigh, pair of blankets, axe, rifle, food, snowshoes, etc., with one Chris. A. Peacock as companion. Cold, sharp wind. Thermometer registered 42 below zero. Took east road to Grassmere 6 miles, thence north east 4 miles to Field's Corners. Here Peacock rued coming: said he was played out, took his things and left me to push on alone. Went east to Joe Heart's, nine miles, and camped. Tired out. Day's tramp 19 miles.

Wednesday, January 11th. Left Heart's at 8 a.m., came to Hood's Portage: hired horse and jumper to take me and pack to Peelar settlement. Camped at C. Peelar's, ill with cold chills and fever. 10 miles.

Thursday, January 12th. I laid up here all day and took a rest as I felt played out. Cold and stormy.

Friday, January 13th. Broke trail to river crossing, being heavy work. Snow deep and ice on river unsafe in places.

Saturday, January 14th. Cadged provisions to river crossing, hung them up in trees and came to lumber camp for night.

Sunday, January 15th. I hired a man to help me carry my stuff and break a trail over the hills and Sucker Lake to Moose Lake in township of McCraney. Camped on south end Moose Lake, sent the man home. Cut wood for night. I think this the hardest day's work I have ever done. I am thankful that I have at last reached the level of the lakes.

Monday, January 16th. After breakfast I took tea-pail, provisions, axe, rifle and one blanket on my back, put on snowshoes and struck north up the lake. Snowshoeing very heavy. I tramped on to Weed Lake, boiled a pot of tea and ate a bite, and reached Clancey's camp on Rainy Lake at dark. After hunting in the bush for some time in the dark, I found a dry cedar and soon had a good fire, and cooked supper.

Tuesday, January 17th. Struck north up 25th side road to Cedar Lake, thence north to Serpent Lake, crossed lake at island and crossed boundary and camped beside an old uprooted pine. Chilled through and through by falling through the ice.

Wednesday, January 18th. I was kept awake all night by the howling of wolves, my feet were so cold this morning that I had to crawl on my hands and knees till I found dry wood to rekindle my fire. About one mile north on river I found a log camp in which I found hanging up 350 feet of gill-net for Salmon-Trout with floats and lead sinkers. Leaving the net till my return I went to south-west shore of Eagle Lake in township of Butt, the ice was not safe. I saw new camp, not used since fall, but no signs of any one. Not having time or food enough to allow me to remain longer, I returned to camp.

Thursday, January 19th. Had a good sleep. Kept warm. Burnt net and floats at sunrise, and cut a hole in the ice and threw the sinkers in the lake. I could not carry them so had to destroy them. Struck south; reached Rainy Lake after dark.

Friday, January 20th. Came south to Moose Lake and camped in Kibble's camp, where I enjoyed a good warm night's rest with my friendly blanket.

Saturday, January 21st. At an early hour I heard a hound giving tongue. I took my rifle and ran up the lake to the big hill where the runway is, just in time to see the hound chasing after a Doe. I shot the dog, and if the wolves haven't eaten him he is likely there yet. I mended snow shoes which took nearly all day.

Sunday, January 22nd. Came south to Nelson's Lake and camped in old house; made fire in one end and chopped a hole in the roof to let the smoke out. As it is Sunday and I have come 8 miles I intend to take a rest.

Monday, January 23rd. Went to post-office; when returning I overheard about a trapper who had set for Beaver on the West Branch.

Tuesday, January 24. Started north again and camped with C. Peelar for the night.

Wednesday, January 25. Went to West Branch and found a fresh snowshoe trail going north. I followed it to the forks and found a No. 3 Newhouse trap set for Beaver and baited with birch browse. I smashed the trap and put it in the river. The track went round the swale and to the sleigh road.

Thursday, January 26th. Came to camp on Loon Lake, loaded my sleigh and started out. Camped for night on Hood's Portage.

Friday, January 28th. I left portage at 7 a.m. and arrived home in Huntsville at 8 p.m., having walked all the way. 26 miles.

I am, Sir,
Your obedient servant,

CHAS. N. CHAPMAN,
Deputy-Warden.

Report of Special Patrol by W. J. Wheeler, Deputy-Warden of Haliburton.

A. D. STEWART, ESQ.,
Chief Warden,
Ontario Fish and Game Commission

SIR,—In compliance with your desire, as expressed in your letter to Mr. C. R. Stewart, I started on Tuesday morning Nov. 8th, to Koklong Lake, in the Township of Glamorgan, and returned the following evening. At Koklong Lake I found a party of five, headed by Mr. W. Boyd, of Bobcaygeon, camped and hunting. They were all in proper order, and expressed their approval of the law of which I was acting as servant.

At the head of Koklong Lake I found Mr. Thomas McGee and George English, of Omemee, a party of six in all. They had five Deer. There were no Fawns killed in either party.

Portaged into Bark Lake, and stopped there the night with Samuel Wright. There was no hunting on Bark Lake. I notified all parties I met with, that I was appointed Deputy-Warden, and should be around all the time to watch that the law was observed. The Omemee hunting party said they were well pleased to find that there were Deputy-Wardens at work to enforce the law.

I called on a man named John McNelly, who I know to be a man who has regularly killed Deer at all seasons of the year, and notified him regarding the law. He admitted he had shot two Deer, and I warned him he was not to kill any more, and read the Act to him. I got back to Dysart railway station in time for the evening train.

I made a round in the two days of nearly forty miles, including the railway. There are two men who need watching, but all the rest of the people will, I think, regard the law, and my trip around has had the effect of convincing them that the law will be enforced.

I now await your instructions, and recommend that you should employ me to make a trip through the north lakes, of about four days.

I am, Sir,
Yours respectfully,

W. J. WHEELER.
Deputy-Warden.

Report of Special Patrol by W. J. Wheeler, Deputy-Warden of Haliburton.

A. D. STEWART, ESQ.,
Secretary Fish and Game Commission. HALIBURTON, Nov. 24, 1892.

SIR,—In compliance with instructions received from you through Mr. C. R. Stewart. I have been attending faithfully to the duties of Deputy-Warden. Last Wednesday, the 16th, the fur buyers, by arrangement, met in this village, and the hunters and trappers for one hundred miles around, came to the appointment. There were three fur buyers, one from Kingston, one from Peterborough and one from Toronto, and about twenty-five trappers. Previous to the meeting I went to Drag Lake, and stood in the portage across which a considerable number of the trappers would have to pass, and inspected their packages as far as practicable. I found no illegal skins. There was about $1,500 worth of skins disposed of in Haliburton, but I do not think there was a single skin disposed of contrary to law. The fur buyers expressed their approval of my being present, and at their request I inspected all their packages before they were shipped on the railway.

On Monday morning, Nov. 21, I left here and went to Drag Lake, and made a long round by canoe and road, through the district north of here. I visited Crooked Lake, Oblong Lake, Moore Lake and several other lakes, and was on foot for three days. I found that there were no hunting camps of any kind, and it was only in one place that I found any antagonism to the Act, and that was a family named Sawyer, who declared they would shoot a Deer whenever they wanted one. They have all their lives been partly dependent on hunting for subsistence. They abused me loudly, but I warned them of the consequences which would follow if they broke the law.

I can, in brief, report that the law through this district has been singularly well observed, and I believe that it was the knowledge that I was travelling around that led more or less to its observance.

I shall make further investigations when the period for "crust" hunting arrives.

I remain, Sir,
Your obedient servant,

W. J. WHEELER,
Deputy-Warden.

Report of Special Patrol by Aaron Biggs, Deputy-Warden of Pembroke.

To A. D. Stewart, Esq.,
Chief Game Warden for Ontario. Pembroke, 19th December, 1892.

Dear Sir,—I beg leave to submit the following report of special duty performed by Mr. Ruben Sweezy and myself in connection with the preservation of Game.

On the morning of November 10, I left Pembroke alone, at 4 a m., and drove up the South Branch of the Indian River, making headquarters at Oak Creek sixteen miles from Pembroke where the Deer were somewhat plentiful, and violations of the law were most likely to occur. From that centre I travelled in every direction, on foot, averaging twenty-five to thirty miles per day. While alone I travelled for the most part on the South Branch, and in the region between the North and South Branches, going about six miles South of the South Branch, almost to the Bonnechere River in many cases.

On the morning of November 24th I was joined by Mr. Sweezy and together we travelled for eleven days more, taking in the North Branch and travelling north and west of this branch. On this trip we found three different hunting parties whom I warned and who left for home at once. On Dec. 3rd, in company with Mr. Sweezy, I arrested one George Acheson who had a Deer in his possession. I brought him to Pembroke at once and had him fined $20 and costs. We posted the printed notices and warnings, in all the old shanties and in other conspicuous places. On this trip we found a place where the skins of fifty Deer had been grained during last February, and I was informed by a settler that sixty five Deer had been killed in that vicinity during February of 1891. The consequence is that Deer are now very scarce in that locality. I learned that the Deer had been run by dogs and killed on the "runways" with axes. This can be easily done in the deep snow.

I occupied December 5th with prosecuting the case against Acheson. December 6th I spent in making preparations for another trip. On the morning of December 7th Mr. Sweezy and myself started for the Opeongo country, going by way of Eganville, making headquarters at a point sixty miles South-west of Pembroke. We visited and travelled the country around Dacre, Burn's Lake, Brudenell Corners, Bark Lake and McLaughlin's Depot. Returning we travelled the North side of Bark Lake, intending to spend a day or two in that neighborhood but were compelled to return on account of prevalence of diphtheria. We could not get admission to any house for food, or shelter, the Detectives and Health Officers forbidding all travellers to stop at the settlers' houses. On this trip we posted notices and warnings at every conspicuous point on the road. There appeared to be no attempt at violating the law, probably to be accounted for by the widespread prevalence of diphtheria. Deer, also appeared to be scarce and we found no traces of illegal hunting.

We started for Pembroke on December 10th, I having been one month and one day engaged in special duty. Mr. Sweezy was with me fifteen days.

Respectfully submitted,

AARON BIGGS,
Deputy-Warden.

OPINIONS OF PROMINENT SPORTSMEN

AND PERSONS KNOWN TO TAKE AN ACTIVE INTEREST IN THE PROTECTION AND PROPAGATION OF GAME AND FISH IN ONTARIO, IN REPLY TO THE FOLLOWING CIRCULAR.

ONTARIO GAME AND FISH COMMISSION.

HAMILTON, Jan. 20th, 1893.

DEAR SIR,—The Commissioners are about to present their first annual report to the Ontario Legislature, and are desirous, before doing so, of ascertaining from the leading sportsmen in the Province and from others who are known to be interested in the protection of Game and Fish, whether, in their opinion, the present Game Laws have worked satisfactorily during the past season, and whether the efforts of the Government, through the Commissioners, to protect and propagate Game and Fish in the Province should be continued.

There will not be room in the Commissioners' report for very lengthy answers, and I will be obliged, therefore, when replying to this circular if you will condense your remarks, making them as brief as possible.

Thanking you in anticipation for the courtesy of your reply, which I hope to receive at your earliest convenience, I am,

Yours very truly,
A. D. STEWART,
Secretary and Chief Warden.

REPLIES.

A. D. STEWART, ESQ.,
Chief Warden,
Ontario Game and Fish Commission.

124 JAMES STREET SOUTH,
HAMILTON, 27th Jan., 1893.

DEAR SIR,—In reply to your circular received to-day, I may state that all the sportsmen I have met during the past few months are well pleased with the Game Laws. I have no doubt but that their observance will be of benefit in the near future to the country at large.

It is, however, notorious that spring duck shooting was carried on to a considerable extent in our bay, and loud complaints were made that such was allowed by the commission. In this case, and still more in permitting shooting of the "Cottontail," a grave mistake was made. Laws should not be made unless enforced. God help the country whose citizens believe that the laws are only made for appearance sake. I know the difficulties from want of means the Commission has had to contend with. It is to be hoped that the Government, boasting as it does of a surplus, will do its duty and grant a much larger sum at the coming session.

I have asked several farmers in the counties about Hamilton if the "Cotton tails" have done much damage to their crops or trees, and not one of them appeared to know anything about the ravages of these animals. I believe that the reports about the ravages of these hares came from men who were debarred by the laws from shooting them when

the ground is covered with snow and the animals easily tracked. If the farmers were asked to report on this subject we would find that the great majority of them knew nothing about "these ravages." It is in the interest of all that Fish and Game should be protected, and the Legislature should be made to understand that Game Laws are not more in the interest of sportsmen than the general public, if so much.

I remain,

Yours truly,

ARCHD. E. MALLOCH, M.D.

A. D. STEWART, ESQ.,
Chief Warden,
Ontario Game and Fish Commission.

160 GEORGE STREET,
TORONTO, January 26, 1893.

DEAR SIR,—In reply to your circular-letter, January 20, 1893, I would thus briefly state :

1. In my opinion the present Game Law is an excellent one on the whole and should certainly be continued in force. It is well calculated to carry out the objects for which it was framed. I suggest the following slight alterations in the Act :

(*a*) Section 7. The omission of the word "enclosed" in line 6. It is impossible to enclose properties, otherwise useless, devoted to the protection of Game. The notice boards, at reasonable distance, and a water front should constitute an enclosure under the the Act. It is a hardship to the owners of such properties that they should be excluded from the benefits of the Act under this section, as they are the chief supporters of the Act itself, whose provisions they try to rigorously enforce.

(*b*) Section 17, clause 1. The information should be made on oath, and violation of the law specified, and date and place stated.

2. As to the enforcement of the Act. Making every allowance for the newly-appointed officers, I do not consider that the present system has worked altogether well during the past season. Clause 2, section 4, has been generally and notoriously violated under my own observation. To remedy this in the future, I am convinced that the Deputy Game Wardens should receive moderate fixed salaries ; and to provide for this would suggest a $1 duty on all guns used for killing game, and a license tax on all sellers of Game. At present the Deputy Game Wardens have little inducement to do their duty, and the loss of the appointment is of little consequence to them. There is every inducement now for them to favor and screen certain offenders who openly violate the law, and, in some cases, I believe I do not overstate the truth in saying, make money by so doing. A moderate salary would make the position more valued and sought after by a better stamp of men than some of those who have come under my observation.

3. The question of masked men openly violating the law is worthy of the serious consideration of the Commissioners. Within my own knowledge it is not unusual for men so masked to shoot large numbers of wild fowl in the spring and out of season : and it is almost impossible to convict them. A man masked and with a gun is clearly engaged in some unlawful act, and it should be made an offence under the Act.

4. I firmly believe that the Act, if enforced, will result in a large increase of Fish and Game, the value of which to the community at large is not, I think, fully appreciated at present.

Yours truly,

G. A. SWENEY,
Pres. Turkey Point Co.

A. D. STEWART, ESQ.,
Chief Warden,
Ontario Game and Fish Commission.

GUELPH, Feb. 14, 1893.

DEAR SIR,—So far as I have had opportunities for forming an opinion, I think the present Game Laws have worked satisfactorily during the past season, and the efforts of the Commissioners should by all means be continued.

There has been in this neighborhood an apparent desire to observe the law, both as regards the seasons and the disposal of Game. I have heard less about infractions than ever before.

I spent some days shooting in the County of Lambton, and I have a similar report to make as to the section where I was.

Yours truly,
A. C. CHADWICK.
Judge Co. Wellington.

A. D. STEWART, ESQ.,
Hamilton.

DUNNVILLE, Feb. 14, 1893.

DEAR SIR.—The Game Laws have worked very satisfactorily during the past season in greatly protecting our game with one exception, this is in granting license to Americans.

A case in point: Last season two Buffalo men came to this neighborhood, got license and hired two or three shooting men with dogs, at so many dollars per day, and killed nearly all the Quail for miles around this part of the country. They were at it all through the season, and I have every reason to believe the birds were all taken to Buffalo clandestinely.

Yours truly,
FREDERICK C. LOWE.

A. D. STEWART, ESQ.,
Chief Warden,
Ontario Game and Fish Commission.

BOBCAYGEON, Feb. 7th, 1893.

DEAR SIR,—In answer to your circular re Fish and Game Laws, I think they have worked splendidly during the past season, and would strongly urge the Commission to continue its efforts to protect both Game and Fish. I would advise that the Deputy-Wardens be instructed to be particularly watchful during the close season for Deer. Great numbers were killed during the latter part of November and December of last season.

I remain,
Yours very truly,
C. E. BONNELL, M.D.

A. D. STEWART, ESQ.,
Hamilton.

OTTAWA, Feb. 11, 1893.

DEAR SIR.—In answer to your circular, I beg to say that for the first time our camp was visited this last season by your Warden, who performed his duties in a very discreet and satisfactory manner. The new laws are very good, but in my opinion the danger to the Game is greater during the summer (out of season) than during November. True sportsmen will not destroy, but many summer tourists are exceedingly reckless.

Our party consisted of Americans, with two exceptions, who would willingly give their testimony if needed.

I am,
Yours truly,
WM. J. TOPLEY.

A. D. STEWART, ESQ.,
Hamilton.

OTTAWA, Feb. 11, 1893.

MY DEAR SIR,—In reply to your circular of date 20th January, I am of opinion that on the whole the Game Laws have worked satisfactorily, but are not enforced sufficiently in strength or breadth. I always thought the open season should be from 15th October to 10th or 15th November—say 10th November. The clause preventing the killing of Fawns every person seems to think of not much value, and it is not viewed seriously by the ordinary sportsman, and I fear not much by the "true blue." I hope open season will be made from 15th October to 10th November.

Yours very truly,
G. C. WOOD.

A. D. STEWART, ESQ.,
Chief Warden,
Game and Fish Commission. WALKERTON, Feb. 15, 1893.

DEAR SIR,—In reply to your circular of the 20th ult., received yesterday, the present Game and Fish Protection Laws are, I think, much better than any we have ever before had, and they have worked satisfactorily in this district excepting the section against shooting Fawns and restricting each person to two Deer. The latter provision should certainly be changed, for when a party goes into a wilderness to hunt Deer they must have the runways guarded, and to confine a man to two Deer is to compel him to break the law or spoil the hunt as soon as he has killed his two Deer. If the law was changed so as to permit a hunting party to kill twice as many Deer as the number of the party, it would produce the same result and be satisfactory to all.

I am,
Yours truly,
WM. BARRETT.
Judge Co. Bruce.

A. D. STEWART, ESQ.,
Chief Warden,
Ontario Game and Fish Commission. TORONTO, 25th Feb., 1893,

DEAR SIR,—Your circular of the 20th Jan. only reached me to-day, or I should have replied sooner.

I think it very desirable that the work of the Commission should be continued, as it has undoubtedly had a very beneficial effect on the protection of Game and Fish in the Province.

The pamphlets, etc., published by the Commission have been very largely circulated and have been the means of informing the public what the Game Laws are. The general public have on their side, in many places, shown a marked desire to see the Game Laws enforced.

The protection of Deer is, I think, one of the most important points the Commission has to deal with, and while the law as it now stands is much better than it was, I am still of opinion that unless the use of dogs is prohibited the Deer will soon be entirely exterminated from the country.

If the Commissioners cannot see their way to recommending the total prohibition of dogs, a compromise might be made between the dog-hunters and the stalkers, by making it illegal to kill the Deer while in the water, and I do not think that the most ardent dog-hunter will have the courage to argue that there is any sport in slaughtering them in the water. If the change were made it would probably be well to increase the length of the season from 1st November to say 25th November. With this exception I have no change to suggest.

Yours truly,
A. H. CAMPBELL, JR.

A. D. STEWART, ESQ,
Chief Warden,
Ontario Game and Fish Commission. ST. THOMAS, 14 Feb., 1893.

DEAR SIR,—In reply to your circular of the 20th ult., received only this forenoon, I would simply suggest that owing to the severity of this winter a great many bevies of Quail and other Game will be starved to death, and a close season of years should be made in order to give the few that remain as survivors a chance to hatch out new broods.

The slaughter of Quail and Woodcock by pot-hunters, who call themselves sportsmen, actually commences before the close season is over, many begin the day before,

where the Game is known to be in cover or feeding. This is done to be ahead of those who are honest about commmencing. The London pot-hunters are particularly given to this habit.

All such men should be double-fined. The Game Laws are for the purpose of fair play amongst sportsmen as well as to preserve the Game

Yours truly,
D. J. HUGHES.
Judge Co. Elgin.

A. D. STEWART, ESQ.,
Chief Warden,
Ontario Game and Fish Commission.

GRAVENHURST, Feb. 17, 1893.

DEAR SIR,—Replying to your circular of 20th ult, I think that the organization of the Ontario Game and Fish Commission was a step in the right direction. Good has been accomplished already, and I think the organization should be continued.

Yours.
A. P. COCKBURN.

A. D. STEWART, ESQ.,
Hamilton, Ont.

CHATHAM, Feb. 7, 1893.

DEAR SIR,—Yours, January 20, to hand, contents looked over, and also thought over. The Game Laws are all right with one exception, that is Woodcock. They should come in on September 1st, in fact that is too late for them in this section of country, and one other thing you yourself could remedy, and that is your Deputies should be men who have some respect for the Sabbath.

Yours truly,
SAMUEL HOLMES.

A. D. STEWART, ESQ.,
Chief Warden,
Game and Fish Commission.

SIMCOE, Jan. 28, 1893.

MY DEAR SIR,—I am obliged by receipt of your circular of 20th inst. I think the Game and Fish Commission is a step in the right direction and should by all means be continued. For a first year I think its work was reasonably satisfactory. I think the Game Laws should be consolidated so that they can be easily understood and the powers of the Commissioners be made as much as possible independent of party control. Then, with such amendments as from time to time the experience of the Commission may suggest, so as to enable and encourage an actual protection and production of Game and Fish, great good can undoubtedly be done.

Yours faithfully,
D. TISDALE, Q.C., M.P.

A. D. STEWART, ESQ.,
Chief Warden,
Ontario Game and Fish Commission.

TOTTENHAM, March 3rd, 1893.

DEAR SIR,—Your circular is before me, am sorry for the delay. Have been away. Hope it is not too late yet. In reply I must say that as far as my knowledge extends the Game Laws have given good satisfaction. I say, yes, by all means let the Government continue its good work, and when I say this I believe it is the voice of all true sportsmen. I may just add that I think the Deer season might be a little earlier.

Yours respectfully,
F. J. HAMMELL, V.S.

A. D. STEWART, ESQ.,
Chief Warden,
Hamilton.

PARRY SOUND, March 6, 1893.

DEAR SIR,—Absence from home caused me to overlook your circular *re* Game and Fish protection up to the present time. If not too late, permit me to say that notwithstanding that the Sub-Warden was not appointed until late in the season, the effect upon the observance of the law as to both Game and Fish was decidedly beneficial. I have lately heard of some crust hunting, but not nearly so much as in former years.

Yours truly,
W. IRELAND.

A. D. STEWART, ESQ.,
Chief Warden,
Game and Fish Commission.

MONTREAL, Feb. 4, 1893.

DEAR SIR,—Replying to yours of the 27th ult., *re* quantity of Game handled during the last season as compared with former years. I caused a circular to be issued to all our Ontario agents asking the question, and I am in receipt of a large percentage of their replies, and the tenor of the whole of them is that the traffic has fallen off a considerable amount during the season of 1892 as compared with former ones. This, no doubt, is due to the efforts put forth by your Commission.

Yours truly,
JAS. BRYCE.
Supt. Canadian Express Co.

A. D. STEWART, ESQ.,
Hamilton.

PARRY SOUND, Feb. 1, 1893.

DEAR SIR,—*Re* your Fish and Game circular, January 20, 1893, I believe the present laws are good and would be productive of good if enforced. Fish are caught here at all times (providing Fishing Inspector is absent) in bag-net, pound-net, or any way. Game shot in season and out of season, as may suit the fancy of the shooter. Close season for White-Fish and Salmon-Trout was right this season of 1892. I believe that the action of the Government to protect and propagate Game and Fish in Ontario should be continued.

Your obedient servant,
J. M. ANSLEY.

A. D. STEWART, Hamilton.

BELLEVILLE, Jan. 30, 1896.

DEAR SIR,—I gave Mr. H. K. Smith my views of the Game Laws and their operation so far as they come under my observation, at some length. I think he handed them in to the Commissioners. I am fully in accord with the Game and Fishery Laws, and would strongly urge their continuance Of course modifications should be made in some cases—amongst others, duck shooting should be between daylight and dark, or same as old law, one hour next before and one hour next after sunrise and sunset respectively. Rabbits should be allowed to be shot in old settled-up localities, except where there are quail up to, say January or February. The law should be made so as to apply to different counties the same as in some of the different States. What might apply here would not be suitable for another locality. Not one "cast-iron" rule for

the whole Province. Our Government should urge strongly upon the Government of Quebec to make their law as to Beaver and Moose the same as our own. Beaver and Moose are now being killed by the Indians and others out North, and the skins smuggled away to the Province of Quebec and sold there.

Special Wardens shou'd be appointed in the Fall to watch some of our northern lakes such as Bark Lake, Little and Big Opeongo, McDougall's Lake and the Victoria. Large quantities of Trout are illegally taken there every fall.

I could give you the names of men in different localities and Indians who should be especially watched. Of course we cannot expect to make the law perfect all at once.

Yours truly,
E. B. FRALECK,
Junior Judge Co. Hastings.

A. D. STEWART, ESQ.,
Chief Warden,
Ontario Game and Fish Commission.

ST. CATHARINES, Jan. 30, 1893.

DEAR SIR,—In answer to your circular of 20th, respecting the working of the Game Laws during the past season being satisfactory or otherwise. They being so much preferable to all previous enactments, I consider that the efforts of the Government, through the Commissioners, to protect and propagate Game and Fish in the Province should be continued. I consider that more and better protection would be rendered by taxing the guns when in the hands of persons off from their own premises, and at least half of the fee realized therefrom be paid to the Deputy-Wardens. There should be one in each Township. The open season for the shooting of Duck, Ruffled-Grouse, Woodcock, Snipe, Plover, etc., should be of the same date, either 1st or 15th September, former preferable. The shooting of Fawn should not be restricted as it is hard to distinguish them from matured Deer when in cover. Deer should be permitted to be taken out of the country by non-residents who have paid license for shooting, as well as Duck shot under such circumstances. The latter should not be confined to the shooting 300, as such restriction does not seem to afford any protection against their diminution, as those not shot here go away and are liable to be shot elsewhere. Non-residents distribute considerable money when hunting here by their hire of guides, transportation, and otherwise, and thereby are acceptable, and consequently I urgently recommennd that the Game Laws receive such amendments as will permit them to take out of the country what Deer (not exceeding two) and Ducks they may shoot.

Very truly yours;
S. D. WOODRUFF.

A. D. STEWART, ESQ.,
Chief Warden.

SIMCOE, Jan. 31, 1893.

DEAR SIR,—In reply to your circular I beg to say true sportsmen have kept the law and poachers and marketers have profited thereby. Right here Partridge and Quail have been sold on the sly, and just where I told your Wardens they would be. As long as a man can legally go through the haunts of the Quail, Woodcock, and Partridge for Cotton-tail, just so long will the law be an utter failure. These are facts. A limited time might be allowed after the hour of sunset for killing Duck. Wild Geese can only be killed here in the spring, and clubmen who are willing to sacrifice this do so to save the annoyance and expense of spring protection of their preserves.

Yours truly,
H. H. GROFF.

A. D. Stewart, Esq.
Chief Warden,
Ontario Game and Fish Commission.

House of Commons.
Ottawa, Jan. 30, 1893.

Dear Sir,—In reply to your circular of 20th inst., I am of opinion that the present Game Laws have worked better than any laws previously in force, and also that the Government should continue to use every means in its power to protect and propagate Game and Fish in this Province. I think, however, that the Game Wardens should be paid salaries, and should be in every case active and fearless men who are, in so far as possible, unaffected by local influences.

I am, dear sir,
Yours very truly,
HENRY R. SMITH.

A. D. Stewart, Esq.,
Chief Warden,
Game and Fish Commission.

Belleville, Ont.
29th January, 1893.

Dear Sir,—Your circular to hand. I consider the Game Laws have done more in this section during the past year for the protection of Game and Fish than ever before, as I found the Game Laws observed this year where they had hitherto been unknown. I think it a *necessity* that the efforts of the Government should be continued.

Yours truly,
H. PARKER THOMAS.

A. D. Stewart, Esq.,
Hamilton.

London, Feb. 6, 1893.

Dear Sir,—In reply to your circular of 20th January, would say that I have found the present Game Laws to work most satisfactorily in all districts I have shot over during the past season, and think most decidedly that the Government should continue to protect and propagate all Game and Fish, but would suggest that Prairie Chickens and English Pheasants be protected for five years, as the members of the C. and M. Sportsman's Association have a number of these birds which they intend to place on their reserve this spring. Of course this is an experiment, but if it does succeed these birds are bound to spread over the whole Western Peninsula.

Yours truly,
E. A. CLEGHORN.

A. D. Stewart, Esq.,
Chief Warden,
Game and Fish Commission.

Dunnville, Feb. 7, 1893.

Dear Sir,—I am very strongly convinced that the efforts of the Government, through the Board of Commissioners, has resulted in much good already, and as one who has had a good deal of experience in shooting and also in Game Clubs for the protection of Game, I heartily endorse the action and laws the Commissioners have made and I believe the best results will not be known until another season comes around.

Yours respectfully,
F. J. RAMSAY.

Shooting Licenses issued to Foreign Sportsmen, 1892.

H. M. Johnson	Boston, Mass.
George N. Smalley	do do
Leonard D. Smalley	Westboro', Mass.
Charles Hayden	Alexandria Bay, N.Y.
George H. Lothrop	Detroit, Mich.
Fitz Hugh Edwards	do do
Strathearn Hendrie	do do
James Glenn	do do
A. E. Brush	do do
J. C. Smith	Utica, N.Y.
George A. Woods, License issued at Port Hope, address not ascertained.	
John T. Lord	London, England.
Franklin R. Perkins	Buffalo, N.Y.
Horatio Hathaway	New Bedford, Mass.
James H. McMillan	Detroit, Mich.
Geo. M. Hendrie	do do
William C. Hodge	do do
Spencer Kellog	Buffalo, N.Y.
Henry Allan	do do
Lt. Col. Clerke	Halifax, N.S.
W. Gayer Dominick	New York, N.Y.
R. E. Fenton	Alexandria Bay, N.Y.
James Damon Lee	Niagara Falls, N.Y.
C. W. Walton	Detroit, Mich.
Lawrence Curtis	Boston, Mass.
James G. Averell	Ogdensburg, N.Y.
S. Gilbert Averell	do do
F. D. Standish	Detroit, Mich.
R. J. Oliphant	Oswego, N.Y.
J. B. Poucher	do do
Augustus Hemenway	Boston, Mass.
Arthur T. Cabot	do do.
William H. Brady	Detroit, Mich.
Richard Crowther	Washington, D.C.
F. L. Bennett	Buffalo, N.Y.
William Gombert	Tonawanda, N.Y.
F. H. Merrick	Buffalo, N.Y.
Charles N. Clark	Syracuse, N.Y.
Charles Hathaway	Cleveland, Ohio.
J. L. Rhodes	Lockport, N.Y.
P. S. Kennard	Cleveland, Ohio.
George M. Kinsey	do do
Richard Cahl	do do
Henry Brown	do do
Barrett Kelly	do do

Frederick Bedore	St. Clair Flats,	Mich.
John Wittwer	do	do
Louis Cabot	Boston,	Mass.
James B. Heron	Alleghany,	Pa.
C. H. Voight	do	do
James A. Collins	do	do
S. H. McKee	do	do
W. Baird	do	do
James W. Grove	do	do
J. N. Davidson	do	do
D. H. McMillan	Buffalo,	N.Y.

List of Deputy-Wardens by Counties.

Algoma.

Anderson, Alexander	Pearl River, C.P.R.
Gilmore, William	Sault Ste. Marie.
Harris, John	do
Brown, Frank	Port Arthur.
Emmons, John	Rat Portage.
Fraser, D	do
Gardner, J	do
McKewen, S. R	Tehkummah.
McKirdy, Wm	Nepigon.
Penfold, Thomas	Port Arthur.
Whalen, Joseph	do
Wetmore, George L	Schreiber.
Riley, Edward	Port Arthur.
Little, J. T	Iron Bridge.
Rush, Robert	Sault Ste. Marie.
Piche, John	Sudbury.
Bole, Duncan	Sault Ste. Marie.

Addington.

Donaldson, Wm. J	Donaldson's Mills.
Meeks, Mortimer	Bell Rock.
Sly, Henry	Verona.
Tryon, Levi	Sharbot Lake.
Tallon, James	Arden.
Vaness, Marshall	Harlowe.

Bruce.

Farquharson, John	Teeswater.
Armstrong, Joseph	Kinloss.
Barley, Edward	Lion's Head,
Garnier, Dr. Jno. H	Lucknow.
Henderson, James	Kincardine.
Heffernan, Patrick	Walkerton.
Hogg, Wm. W	Paisley.
Lawson, W. H	Park Head.
Millons, Robt	Walkerton.
Manly, David	Riversdale.
McKillop, Hugh	Hepworth.
Grey, Wesley	Chesley.
McIvor, John	McIver.
McFarlane, Duncan	Red Bay.
McDonald, Donald	Ripley.
Pratt, John	Kincardine.
Richards, Chas. A	Tara.
Scott, John	Dyer's Bay.
Henry, George	Port Elgin.

Brant.

Montgomery, C. A	Brantford.
McLaughlin, Geo. W	do
Irving, Robert P	Glenmorris.
Kitchen, Dr. E. C	St. George.

CARLETON.

Graham, R. T.....South March.

DUFFERIN.

Durkin, William.....Bowling Green.
Marshall, James E.....Shelburne.
Rowbotham, Wm.....Redickville.

DURHAM.

Hales, Hugh B.....Port Hope.

DUNDAS.

Cameron, Lachlin.....Iroquois.
Price, James.....Inkerman.

ELGIN.

Fairbrother, Wm.....St. Thomas.
Fowler, Jacob.....Fingal.
Gignac, Hilaire.....Gordon.
Hannen, Isaac.....Union.
Hopkins, John.....St. Thomas.
Huffman, Jeremiah.....Aylmer.
Hammond, John.....do
Kirkpatrick, Donald.....West Lorne.
Miller, Robert.....Lawrence Station
Neely, John R.....Fingal.
Philpott, William J.....Iona.
Thornton, Henry.....St. Thomas.

ESSEX.

Banks, Anthony.....Harrow.
Britt, G.....Wheatley.
Cornette, Charles F.....Belle River.
Campbell, Duncan C.....Staples.
Holland, Hugh.....Comber.
Hofferd, William.....Windsor.
Hillman, Jonas.....Hillman.
Lindsay, William.....Comber.
Lemaitre, Seraphim.....Tecumseth.
Mills, Charles.....Wheatley.
Masters, Allios.....Sandwich.
Meloche, Joseph.....do
Robert, Joseph.....do
Rivard Napoleon.....Tecumseth.
Soulliere, Stephen.....do
Souchereau Stephen.....St. Clair Siding.
Wilson, Samuel.....Sandwich.
White, James H.....Pelee Island.
Walker, Noe.....St. Joachim.

FRONTENAC.

Brickwood, James H.....Kingston.
Albertson, George.....Verona.
Clark, Norman.....Mississippi Station.

Dermott, J. A..... Tichborne.
Dowker, William S..... Harrowsmith.
Gates, George..... Westbrook.
Greenwood, George..... Wolfe Island.
Halliday, F..... Mississippi Station.
Martin, John..... Barriefield.
Pallier, Alexander..... Wilmur.
Snooks, Edward H..... Desert Lake.
Walker, Nelson..... Cataraqui.
Smith, David John..... Parham.
Theobald, John M..... Kingston.
Gilbert, Robert..... Ompah.
Kirkwood, Jas. W..... Levant Station.
Woodman, W. G..... Allan, Wolfe Island.
York, E. M..... Bellrock.
Burke, Robert, jr..... Clarendon Station.
Davey, Sydney W..... Murvale.

GREY.

Campbell Malcolm..... Hanover.
Holmes, George B..... Walter's Falls.
Long, William..... Kolapore.
Wilson, William H..... Shouldice.
Siegman, Ludwig..... Neustadt.

GRENVILLE.

McConnell, Wayland F..... Gladstone.

GLENGARRY.

Clark, James..... Dominionville.
McGillivray, Donald W..... Dalkeith.
McNaughton, J. P..... Laggan.
McDougall, D. P..... Maxville.
McRae, Donald C..... North Lancaster.
Stewart, M. W..... Greenfield.
Dickson, Daniel..... Williamstown.

HASTINGS.

Airhart, George W..... Stirling.
Adams, George..... Hermon.
Barr, Peter..... Maynooth.
Brinklow, Henry..... Ormsby.
Birrel, James..... Glanmire.
Faulkner, Dr. D. W..... Foxboro'.
Faulkner, Dr. G. W..... Stirling.
Foster, Alexander..... Egan Creek.
Mairs, James H..... Bridgewater.
Reid, George..... Madoc.
Speck, William..... Bridgewater.
Sweet, W. H..... Bancroft.
Sweet, W. James..... do
Stanyer, Thomas..... do
Tivy, Richard S..... Coe Hill.
Unwin, Walker..... Bannockburn.
Bowell, W. J..... Tweed.

HALTON.

Bradley, Stinson ..... Milton.
Brown, Robert M ..... Campbellville.
Crawford, Murray ..... do
Grant, Lachlin ..... Georgetown.
Johnson, Walter M ..... Milton.
Saunders, Edward G ..... Agerton.
Wilson, James ..... Bronte.
Lawson, John ..... Acton.

HURON.

Dalton, Morgan ..... Kingsbridge.
Kinnsman, R ..... Wingham.
Naftel, Charles J. S ..... Goderich.
Paisley, William ..... Clinton.
Ross, John M ..... Blyth.
Sands, John ..... Saltford.
Seager, Charles ..... Goderich.
Scott, Alex ..... Westfield.
Horton, Geo ..... Gerrie.

HALIBURTON.

Day, Joseph ..... Essonville.
Paul, Joseph ..... do
Wheeler, Wm J ..... do
Turnbull, Jas ..... Minden.

HALDIMAND.

Chrysler, Robert ..... North Cayuga.
Everingham, Wm ..... Canfield.
Farrell, John ..... Cayuga.
Johnson, Peter ..... Dunnville.
Thompson, Wellington ..... Port Maitland.
Winslow, Martin ..... Dunnville.

KENT.

Boles, Gordon ..... Chatham.
Crouch, Samuel ..... Ridgetown.
Eberts, Frank G ..... Chatham.
Johnson, W. J ..... Fargo.
Kime, George ..... Big Point.
Merritt, Asra ..... Ouvry.
McCollum, Thos ..... Morpeth.
Robinson, Victor ..... Chatham.
Southgate, R. M ..... Wallaceburg.
Thomas, Joseph ..... Williams.

LAMBTON.

Blair, William ..... Port Lambton.
Bell, John ..... Port Franks.
Deans, James ..... Inwood.
Kennedy, Joseph ..... Port Lambton.
Miller, Frank ..... Port Franks.
Mott, Edwin L. ..... Alvinston.

LANARK.

Mair, David ..... Lanark.

LEEDS.

Smith, Justus ..... Charleston.
Sly, Lester ..... Morton.
Bilton, George ..... Newboro'.
Lappin, J. J ..... Westport.
Sliter, A. E ..... Morton.

LENNOX.

Huff, Hiram W ..... Napanee.

LINCOLN.

McPherson, James ..... St. Anns.
Kennedy, C. A ..... Smithville.

MIDDLESEX.

Allen, B. B ..... London.
McCann, Peter ..... do
O'Neil, W. H ..... Dorchester.
Ward, R. W ..... London West.
Ralph, Thomas J ..... Ballymute.
Beverley, John ..... Dorchester Station.
Dixon, Michael ..... Cashmere.
Williams, Alfred M ..... Lobo.

MONCK.

McDowell, Andrew ..... Stromness.
Petit, Arthur ..... Moulton Station.
Barwell, John ..... Wellandport.
Moore, Daniel ..... Perry Station.

MUSKOKA.

Butler, C. F ..... Port Kaye.
Brown, Robert D ..... Port Sydney.
Brooks, Edgar, jr ..... Antioch.
Berry, William ..... Walker's Point.
Bettes, J. H ..... Muskoka Mills.
Broadley, Enos ..... Beaumaris.
Carmichael, Wm ..... Powassan.
Chapman, Chas. N ..... Huntsville.
Crompton, W. B ..... Aspdin.
Davidson, Wm ..... Bracebridge.
Gouldie, E. J ..... Dwight.
Gohm, William ..... Bracebridge.
Henderson, Chas ..... do
Harborn, John ..... Whiteside.
Hollingshead, Walter M ..... Huntsville.
Kirton, Mackie ..... do
Kaye, Alfred ..... Port Sydney.
Mitchell, Robert ..... Cecebe.
McConnell, John ..... Muskoka.

McDonald, Arch	Sundridge.
McNab, Donald	Nipissing.
Paget, George	Huntsville.
Ricker, David	Commanda.
Shannon, Peter	Port Carling.
Taylor, C. N	Gravenhurst.
Thornton, Richard	Huntsville.
Wood, Michael	Clevelands.
Wilkins, George	Baysville.
Warne, Francis P	do
Wroe, Thomas W	Beauman's.
Wasdell, John	Bracebridge.
Lawrence, John	Shannon Hall.

NORFOLK.

Baker, Huit	Windham Centre.
Brown, Isaiah	Port Rowan.
Barrett, A. P	Port Royal.
Clark, Benjamin	Simcoe.
Duncan, Jas. L	Forrestville.
Dowswell, John	Lynedoch.
Ewing, Alex. R	Waterford.
Fick, Jerome B	Port Dover.
Hambly, Wm. E	Rockford.
Nickerson, W. F	Simcoe.
Randall, Robert	Bookton.
Wilson, Abner	Lynedoch.

NORTHUMBERLAND.

Diamond, T	Cobourg.
Field, Cyrus W	do
Fairbanks, Dr. Chas. S	do
Nimmo, T. J	Bensford.
Wedlock, James	do
Wallace, Thos	Gore's Landing.

NIPISSING.

Huntington, S. L	North Bay.
Garrow, E	Nipissing Junction.
Sloman, Alfred	Trout Creek.
Butler, Clarence H	do

OXFORD.

Tisdale, J. C	Woodstock.
Martin, Richard	do

ONTARIO.

Bagshaw, Obed E	Vroomanton.
Hall, Maxwell	Longford Mills.
Frankish, F. M	Uxbridge.
McGrath, Michael	Brechin.
McMillan, D	Beaverton.
Sutliffe, James	Prince Albert.
Williams, Charles	Glen Major.
Gordon, Jno	Pickering.
Willis, Jas	Whitby.
Henry, T. S	Cedardale.
McDermott, Geo	Port Perry.

PRINCE EDWARD.

Lake, Stephen	West Lake.
Sprague, Geo. G	Demorestville.
Rorabeck, Athol	Crofton.

PETERBOROUGH.

Ludgate, Theodore	Peterborough.
Lambert, Henry	Silver Lake.
Moore, F. J	Lakefield.
Moore, D. H	Peterborough.
Montgomery, David R	Hall's Bridge.
Merriam, H. N	Harwood.
McWilliams, J. B	Peterborough.
Smith, J. W	do
Wedlock, William	Keene.
Hartley, E. J	Peterborough.

PARRY SOUND.

Burns, C. W., sr	South River.
Doupe, Sydney	Laurence Mills.
Draycott, F. W	Ashdown.
Fry, Arthur	Seguin Falls.
Hall, William H	Sprucedale.
Johnston, John A	Parry Sound.
Kennedy, W. E	Maganetawan.
McDermott, Benjamin	Sundridge.
McGown, William	Parry Sound.
Ward, Thomas B	Burk's Falls.
McAmmond, Wm	Dunchurch.
LaBrash, James P	Maple Island.
French, Benjamin	Dunchurch.

PRESCOTT.

Bonville, Leon	St. Isidore de Prescott.
Barett, John	Fournier.
Cunningham, A	Wendover.

Ferguson, Wm	Vankleek Hill.
James, Richard	Alfred.
La Belle, Leonce	Curran.
Marston, Lewis F	L'Orignal.
Martineau, Joseph	Alfred.
McKercher, Peter	L'Orignal.
Ross, Joseph	Vankleek Hill.
St. Pierre, Pierre	St. Eugene.
Scott, David	Riceville.
LeRoy, Ralph	Barb.
Lefaivre, Hercule	Lefaivre.

PERTH.

Climie, W. R	Listowell.

RENFREW.

Brady, John	Renfrew.
Biggs William E	Pembroke.
Biggs, Aaron	do
Coffey, William	do
Johnston, S. M	Arnprior.
Kennedy, John	Pembroke.
McCagherty, P	do
McDonald, Alex	do
Plaunt, Xavier	Renfrew.
Smith, Robert R	Eganville.
Halliday, James	Springtown.

SIMCOE.

Bathie, Edward	Cookstown.
Beardsley, Alfred W	Barrie.
Chapman, James	Cookstown.
Fildey, George	do
Hines, John	Barrie.
Kearns, George	Ivy.
Moir, John	Cookstown.
Mills, William	Elmvale.
McLaughlin, James	Anten Mills.
McLeod, John	Hammil's Point.
Nolan, James	Newton Robinson.
Primrose, Alex	Apto.
Pollock, Thomas	Cookstown.
Ross, Joseph	do
Regan, John	Orillia.
Rawson, William	Coldwater.
Somerville, David	Stayner.
Upton, George	Nicolston.
Wilson, J. J	Fesserton.
Kitchen, Joseph	Lovering.
Shakell, Wm	do

VICTORIA.

Bowins, Charles	Coboconk.
Crowe, Nathaniel	Bobcaygeon.
Dewdney, Arthur W.	do
Daniel, John	Balsam Grove.
Ellis, J. A	Fenelon Falls.
Galloway, David	Moore's Falls.
Howie, John	Bury's Green.
Junkin, James	Fenelon Falls.
Harris, Noxon	Bobcaygeon.
Lysh, William	do
Nicholls, Gardiner	do
McArthur, Donald	Manilla.
Silverthorn, George	Balsover.
Wills, T. J	Bobcaygeon.

WELLAND.

Augustine, Elias	Stonebridge.
Barnhart, George	Sherkston.
Griffin, Richard	Fort Erie.
Hershey, Milford	Garrison Road.
Nixon, J. C	Welland.
Neff, Peter	Marshville.
Page, A. E. O	Ridgeway.
Rose, Charles, jr	Garrison Road.
Risley, E. E	International Bridge.
Teal, Irwin	Ridgeway.
Miller, Charles A	Black Creek.
Beam, Horace H	Black Creek.

WATERLOO.

Bulmer, George	Elmira.
Devitt, John	Berlin.
Fraser, Alex	New Hamburg.
Gildner, Henry	Berlin.
Gillies, Peter	Galt.
Hall, James	Hawksville.
Menger, William	St. Jacobs.
Mickers, Joseph	Heidelberg.
Mayers, Frederick	Bridgeport.
McCruden, Robert	Galt.
McMaster, Thomas	Hespeler.
Stark, John	do
Springer, Joseph	Kossuth.

WENTWORTH.

Hazel, John	Hamilton Beach.
Raspberry, William	West Flamboro'.
Gallin, Warran	Waterdown.

WELLINGTON.

Atkinson, Geo. Osborn	Guelph.
Hull, Wellington	Erin.
Gordon, James	Monticello.
Love, James	Guelph.
McGinnis, Alex	Arkell.
Smith, George	Eden Mills.
Williams, Henry M	Guelph.

YORK.

Browne, Hume	Toronto.
Hope, W. B	Toronto.
Tidsberry, James L	Coleman

PROVINCE OF QUEBEC.

*Cowley, E. A	Montreal.
*Finnie, Dr. J. T	do

* These officers have been specially appointed to enforce the Game Law on Lake St. Francis, which is partly in Ontario and partly in Quebec.

Reports of Persons to whom Permits were given during 1892 to take Speckled Trout for the purpose of collecting Ova.

A. D. STEWART, Esq.,
Secretary Game and Fish Commission.
Hamilton.

REDICKVILLE, Feb. 13th, 1893.

DEAR SIR,—I received the permit for which I am truly thankful, and I made use of it although it was late in the season. I got a small amount, for the trout commenced very early last season. They were in full vigor by the 20th of September, and they were well scattered by 10th October, and they soon began to be scarce to get, so that I did not get my small hatchery filled up. My means were small, so I commenced small, but I hope to have your favor so that I can enlarge my building and work on a large scale. I think they have done favorably well. I got as near as I could tell a hundred thousand eggs, and I have got seventy thousand fry. I commenced work on the 11th day of October, and I saw the first living fry on the the twenty third day, and they are all out now and doing well. I also beg pardon for not answering your inquiries, for I happened with a misfortune and was not able to leave home until Saturday last, the 11th of February, and the roads have been so filled up with snow that I could not get out from my place.

I remain,
Your obedient servant,

WILLIAM ROWBOTHAM.

A. D. STEWART, Esq.,
Sec. and Chief Warden,
Fish and Game Commission, Hamilton.

ALTON ONT., Jan. 26th, 1893.

DEAR SIR,—I am in receipt of yours of the 24th inst. making enquiries as to how we got along with the permit you granted me to obtain ova last fall. In reply I beg to state that we took no action whatever in the matter. Several times I thought of going out to try and get some ova, but bad weather or something always prevented till finally it froze up and nothing could be done. We have arranged for the purchase of fry to be delivered in the spring for the purpose of stocking our pond. We have a magnificent pond embracing five acres in area and expect some day to have good fishing. Thanking you for your interest in the matter.

I remain yours truly,

JOHN DAVIS,
Sec. Alton Fishing Club.

Hopedale Trout Hatchery,
HILLSBURG, Jan. 27th, 1893.

A. D. STEWART, Esq.,
Secretary Game and Fish Commission, Hamilton.

DEAR SIR,—Enclosed are rough drafts of my Hopedale Trout Hatchery that you may form an idea of what I am doing and my facilities for the enterprise.

Plan No. 1, shows the streams and their sources, though both streams are much more crooked than in the plan, giving me nearly two miles of an excellent Trout stream naturally filled in several places for making ponds at small cost. The springs have a volume of ever running water sufficient to keep any ponds I am likely to make pure and clean and make them perfect Trout ponds.

Plan No. 2, shows the supply spring hatching house and ponds built and being intended to be built this coming season. The water from the supply pond enters the hatchery at a height of ten feet, and the pond will be from 8 to 12 feet in depth. The hatching house is a tasty rustic building 18x24 ground, and when completely fitted up will have a capacity of 5,000,000. It is so arranged that parent Trout from the stock pond can go into a race, with a gravel bottom in the centre of house when ready to spawn where I can handily take them when ripe, (a very important point for successful hatching). The stock pond as at present covers about a quarter of an acre, and the circular young Trout pond about the same. The one for two year old Trout is nearly the same size. They are irregular in shape having been built to conform with their surrounding. The pond shown as one intended to be built the coming season will cover about six acres, into which I shall set the Trout after the second year.

As I commenced late in the summer I did not get as much down as I hoped for, though I did fairly well. I got over 2,000 parent Trout, some of them very fine ones. From these I got 100,000 ova and placed it in the hatchery troughs. Taking the ova from the fish as the fish are taken from the streams does not give as good results as can be had when the ova can be taken from the Trout when perfectly ripe as will be the case in my spawning race. I cannot yet tell what proportion of the ova taken this year will hatch, but think I can safely count on about 60,000. They are hatching finely now much better than I expected considering the unsatisfactory way I had of getting the ova in good shape. Under careful management with my facilities for taking the ova in the hatchery house I shall consider a loss of 10 per cent. large in future. The first ova I placed in the trough was on the 11th October and the last on 15th November, though spawning was not entirely over at that date.

We have in this section some very fine Trout streams and Trout of a particularly fine species. The streams are getting pretty well cleaned out. I do not however impute this so much to excessive fishing as the change in the water resulting from clearing up the land.

If in this neighborhood I should be pleased to have you call and see me.

Yours,

GEORGE A. LACEY.

Table of Resolutions adopted at the International Game and Fish Conference held at Detroit, Mich., U.S.A., on 20th and 21st December, 1892.

GENTLEMEN,—Your committee, to whom was referred the question, "whether or not there should be a close season for White-Fish, Lake or Salmon-Trout and Herring," also what means should be taken for their protection, would report :

1st. All small fish and those unfit for food of all kinds when taken in nets, should be replaced in the water where taken alive, and that fishermen should not be allowed to take such fish on shore, nor expose them for sale.

2nd. That no string pound nets used in the lakes shall extend more than four miles from shore.

3rd. That one-half at least of all channels between islands or elsewhere, where fish migrate to spawn, shall be kept free from nets of all kinds at all seasons.

4th. That all White-Fish taken of less than sixteen inches in length, and all Salmon-Trout less than two pounds in weight should be immediately returned to the waters where taken and shall not be exposed for sale. That all Herring less than eight inches in length, and all Wall-Eyed Pike less than twelve inches in length shall be returned to the waters where taken and shall not be exposed for sale.

5th. That the month of November in each year be made a close season in all the great lakes for White-Fish, Herring and Salmon or Lake Trout.

Your committee would further recommend that all penalties fixed for violations of any laws that shall be enacted shall be made not only to apply to those who take fish, but also to all persons who buy, sell, transport or have the same in possession.

Resolved, That the law should authorize the seizure and destruction of nets used in violation of law.

Mr. Gould, of Maine : I have drawn up a resolution here that I would like to place before the Conference for their consideration on the subject of uniformity of laws.

Whereas, The different state Fish and Game Commissioners are more in touch with the laws and their defects throughout the entire State where they may hold office ; and,

Whereas, Their knowledge of the general requirments in a given instances is greater than that of the laity at large ; and,

Whereas, By reason of their office and intimate knowledge of the needs, they are called upon to make suggestions during the legislative session ;

Resolved, That in the opinion of the International Fisheries' Conference it is plainly the duty of the State Commissioners to make such recommendations to their respective State Legislatures as their experience in the practical workings of their laws regulating the taking of fish may dictate.

Resolved, That the States are fully competent to make wholesome laws for the protection of their Fish and Game.

Resolved, Further, that where in case from lack of intimate knowlege of the habits or the place in the economy of nature of any given species of fish occupies, the Commissioners shall advocate such restrictive legislation as will leave no doubt as to its efficacy until such investigation has been made as will enable them to give intelligent recommendations on the subject

Resolved, That in the judgement of this Conference there should be a close season for Black-Bass and that such season should be between the 1st of April and the 15th of June, and all kinds of fishing, including spearing, should be prohibited in the close season.

Resolved, That it is the sense of this Conference that the necessity exists for an efficient and uniform enforcement of protective laws by a paid Fish and Game Department, on the general basis of the New York laws."

TABLE OF CASES PROSECUTED

NOTE.—This table although correct as far as it goes, is not full. Many cases have Deputy-

District or County.	Name of Prosecutor.	Date. 1892.	Name of Offender.	Address.	Offence Charged.
Algoma	John Piche				
	Thos. Penfold	Aug. 27th	Levi Lindsay	Port Arthur	Illegal fishing
	"	"	Joseph Genon	"	"
	"	Oct. 21st	W. J. Clarke	"	Shooting partridge.
	S. R. McKewen	March 2nd	Jas. Hilson	Michael's Bay	Fishing out of season.
Addington	Mortimer Meeks	July 20th	Levi Brown	Moscow	Shooting duck out of season.
	"	"	Sherman Brown	"	"
	"	"	Clayton Brown	"	"
	"	"	Amos Duffman	"	"
	"	"	Edward Makin	"	"
	"	July 21st	Geo. Sumers	Mountain Grove	Having mink in possession out of season.
Bruce	David Manley	Jan. 19th	Francis Casknett	Riversdale	Sunday shooting.
	J. H. Garnier				
	J. H. Armstrong	Oct. 24th	Chas. Beecher	Kinloss	Throwing sawdust in Silver Lake.
Carleton	R. T. Graham				
Elgin	W. T. Fairbrother	Dec. 29th	Ed. Gorvett	Sparta	Shooting hares
	"	"	John Butler	St. Thomas	Exposing hares for sale.
Essex	Allios Masters & J. D. Meloshe	Nov. 30th	Chas. H. Louis	Detroit	Shooting without a license.
		"	Henry Boschee	"	"
	Anthony Banks	Oct. 13th	Thos. H. Ferris	Harrow	Exposing a fawn.
	"	Dec. 12th	Allios Pare	"	Sunday shooting.
	Samuel Wilson	Sept. 12th	John Meloche	Sandwich, West.	"
	"	Sept. 16th	Wm. Fredericks	" East	Shooting squirrels out of season.
	"	Nov. 4th	E. H. Nelson	Detroit	Shooting without a license.
	"	"	Alex. Binsette	Sandwich, East.	Killing game out of season
Frontenac	J. H. Brickwood	Jan. 20th	Richard Horning	Elginburg	Illegal fishing
	"	"	Jacob Horning	Murvale	"
	"	"	Wm. Irving	Elginburg	"
	"	Jan. 21st	Chas. Lyons	Latimer	"
	"	Jan. 6th	J. Ferguson	Inverary	"
	"	" 21st	F. Guess	Elginburg	"
	"	" 21st	J. Toles	Inverary	"
	"	" 18th	Dr. Freeman	"	"
	"	Feb. 25th	A. Richie	"	"
	"	"	Wm. Huston	"	"
	"	Mar. 23rd	C. Lyons	Latimer	"
Grey	W. H. Wilson	Sept. 22nd	Jas. W. Lee	East Linton	Killing partridge out of season.
	"	Nov. 23rd	A. Harriman	Owen Sound	Killing deer out of season.

BY DEPUTY-WARDENS.

not yet been reported owing to the want of a proper system of collecting reports from the Wardens.

Was Offender arrested or summoned.	Where tried.	Name of Magistrate.	Result of Case.	Nets, traps or illegal appliances seized during season of 1892.
.....	.....	.....	.....	26 traps, 9 nets, 200 snares destroyed.
Summoned	Port Arthur.....	D. F. McDonald. / W. W. Russell..	$10 and costs	1 net.
"	"	"	$10 "	
"	"	W. C. Dobie	$5 "	
"	Michael's Bay.....	S. R. McKewen	$5 "	
Summoned	Yarker..... ...	Jno. A. Shibley.....	Dismissed.	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	Sharbot Lake.....	"	Fined $5 and costs.	
Summoned	Walkerton	H. W. Robb.....	Dismissed.	
.....	.....	.....	.....	A number of traps destroyed.
Summoned	Walkerton	Mr. McNamara	Dismissed.	
.. ..	....	.. ..	.....	Seized 6 traps, 2 nets, 1 spear. Destroyed 12 snares.
Summoned	St. Thomas	W. J. White.....	Fined $5	
"	"	"	Withdrawn.	
Arrested	Windsor	Alex. Bartlett	Fined $20.	
"	"	"	"	
Summoned	Harrow	Jno. Richmond	Dismissed.	
"	"	"	Find $5.	
Arrested	Windsor	Alex. Bartlett	$5 and costs.	
Summoned	"	"	$5 "	
Arrested	"	"	$20 "	
Summoned	Left the country on receipt of summons.			
Summoned	Portsmouth	D. J. Walker.....	$10 and costs.	
"	"	"	$10 "	
"	"	"	Dismissed.	
"	"	"	$10 and costs.	
"	"	"	$10 "	
"	"	"	$10 "	
"	"	"	Dismissed.	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	$10 and costs	
"	Owen Sound.....	Geo. Price.....	$5.	
"	"	"	$25.	

TABLE OF CASES PROSECUTED

District or County.	Name of Prosecutor.	Date. 1892.	Name of Offender.	Address.	Offence Charged.
Haldimand	W. Thompson....	Oct. 22nd ..	Jas. Siddal	Port Maitland .	Fishing on Sunday.
	" .	" ..	Henry Siddal.....	" .	Fishing on Sunday.
	" ..	Mar. 27th, ...	A. V. Hammond.	Dunnville	Breaking open muskrat houses and shooting on Sunday.
	" ..	" 26th, ...	Henry Fox	"	Shooting on Sunday.
	Jno. Farrell.....	Sept. 14.....	Geo. Runchy	Clanbrassil	Shooting partridge.
Haliburton	Jas. Turnbull....	Nov. 7th	A. Simpson.....	Minden	Having a fawn in possession.
	"	" 12th	A. Gurrey.....	"	"
	"	" 28th	Thos. Walters	Lindsay	Killing fawn ....
	"	Dec. 16th	D. Bull.....	Stanhope	" deer ....
	W. J. Wheeler ..	Nov. 29th	F. Austin	Haliburton	Selling deer out of season.
	" ...	"	G. Bemister.....	"	"
Hastings	George Reid.....	Oct. 18th	John Bailey.....	Madoc	Trapping.....
	"	" 22nd	Adam Palmateer.	"	" ... ...
	"	" 22nd ...	Thos. Cotton.....	"	" .....
	"	" 24th	Donald Henderson	"	Fishing with nets.
	Geo. W. Airhart..	Dec. 16th	Wm. Darrah	Marmora	Killing fawn ....
	Thos. Stayner	Oct. 26th	Davy Brothers ..	Bancroft	Putting sawdust in river.
	"	Oct. 19th	Walter Kidd	"	Killing deer out
	"	"	Wm. Kidd	"	of season and as-
	"	"	Jno. Watson	"	saulting wardens
	Peter Barr	Dec. 24th	Wm. Haskins	Maynooth	Selling deer out of season.
	Walker Unwin ..	.....	.....	.....	.....
	William Sweet ...	Jan. 31st	August Brethour .	Bancroft	Having deer in possession.
	" ..	"	John Sorrars	" .	Killing deer .
	Alex. Foster.....	Nov. 29th	David Brushang ..	Mayo	Having deer in possession.
	"	"	Reub. Dillabough.	"	Killing deer ....
Kent	George Kime	Oct. 15th.....	Arthur Sly	Chatham	Trespassing ....
	"	Jan. 3rd ...	D. Martin.....	"	" .....
	"	Oct. 15th, ...	Chas. Brooks	Dover Centre ..	" .....
	"	Jan. 3rd, ...	J. Scheff	Dover East.....	" .....
	"	Oct. 15th	Andrew Brown ..	Chatham	" .....
	"	Jan. 3rd, ...	D. Palette.....	Dover East....	" ...
Leeds	Lester Sly.....	Jan. 14th. ...	Jerry Griffin	Lyndhurst	Fishing with nets.
Lennox	Hiram Huff	Nov. 17th ...	Emmanuel Wager.	Bogartville	Catching and killing fish.
	"	" ...	George Lindsay ..	Napanee	Catching muskrats.
	"	"	James Cummings.	"	Killing fish.....
	"	"	Wm. Detlor.....	Erinsville	" .
	"	"	Adam Mathews ..	"	" .....
	"	"	Walter Pipus	Napanee	Killing muskrats.
	"	"	John Nail.....	Erinsville	" fish .....
	"	"	Samuel Davy	Napanee	" muskrats
	"	"	Joshua Snider....	Snider Depot ..	" fish .....
	"	"	Henry Lake.....	" ..	" " .....

BY DEPUTY-WARDENS.—*Continued.*

Was Offender arrested or summoned.	Where tried.	Name of Magistrate.	Result of Case.	Nets, traps or illegal appliances seized during season of 1892.
Summoned	Dunnville	Jno. Taylor	$2 and $6 costs.	
"	"	"	"	
"	"	"	$5 and $3 costs.	
"			Dismissed.	
"	Cayuga	A. A. Davis and T. Martindale	$5 and costs.	
"	Minden	Wm. Fielding	Dismissed.	
"	"	"	$20 and costs.	
"	"	"	Dismissed.	
"	"	"	$20 and costs.	
"	Haliburton	"	"	
"	"	"	"	
"	Madoc	J. J. B. Flint	$5 and costs.	Seized 3 gill nets.
"	"	"	"	
"	"	"	"	
"	"	"	$10 "	
"	Stirling	G. W. Faulkner	$20 "	
Summoned	Bancroft	Jas. Cleak	$10.	
This case not yet tried — warrant has been issued for arrest of defendants.				
Summoned	Bancroft	Jas. Cleak	$10.	
				Seized some night lines.
Summoned	Bancroft	James Cleak	Dismissed	Seized 2 steel traps.
"	"	"	"	
"	"	"	$10 and costs.	
"	"	"	$10.	
"	Chatham	Mr. McNaughton	Allowed to go under suspended sentence.	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	Lyndhurst	E. C. Sleter	Fined $5.	
"	Napanee	Jas. Daly	" $10.	
"	"	"	" $5.	
"	"	"	" $10.	
"	"	"	" $10.	
"	"	"	" $10.	
"	"	"	" $5.	
"	"	"	" $10.	
"	"	"	" $5.	
"	"	"	" $10.	
"	"	"	" $10.	

TABLE OF CASES PROSECUTED

District or County.	Name of Prosecutor.	Date. 1892.	Name of Offender.	Address.	Offence Charged.
Lennox	Hiram Huff	Dec. 23rd	Henry Lindsay	Napanee	Killing muskrats.
	"	"	Fred Sherman	"	" fish
	"	"	Thos. Mequain	"	" "
	"	"	Jas. Pollard	Adolphustown	" "
	"	"	Robt. Cousins	"	" "
	"	"	Felix Mellon	Sillsville	" "
	"	"	Seth Benson	Deseronto	Fish in possession.
Middlesex	Peter McCan	July 9th	Wm. Smith, sr. Wm. Smith, jr. Peter Smith Frank Neely	Thamesford	Killing fish with dynamite.
Muskoka	R. D. Brown	Oct. 22nd	Jos. Prebbles	Huntsville	Hunting deer out of season.
	"	"	Asaph Markle	"	"
	"	"	Lester Markle	"	"
	"	"	Beny Cottrill	Port Sydney	"
	"	Nov. 22nd	Philip Shay	Huntsville	"
	"	"	Wesley Markle	"	"
	C. F. Butler	Sept. 13th	Thos. Packer	Torrance	Having game in possession.
	C. N. Chapman	Dec. 17th			
	"	Dec. 21st			
	"	Jan. 25th			
	E. J. Goldie	Oct. 25th	J. H. Moulton	Orono	Fishing out of season.
	"	"	Jesse Trull	Oshawa	"
	"	"	J. S. Roe	"	"
	"	"	Jas. Bell	"	"
	"	Nov. 5th	H. Franks	Toronto	Killing fawn
	"	Dec. 1st	Percy Punchon	Oshawa	Killing deer out season.
	"	Oct. 25th	J. H. Moulton	Orono	Illegal netting
	"	"	Jesse Trull	Oshawa	"
	"	"	J. L. Roe	"	"
	"	"	Jas. Bell	"	"
	Michael Woods	Nov. 5			
Northumberland	Thos. Wallace				
Oxford	Richard Martin	Dec. 10th	A. Goddard	Woodstock	Spearing out of season.
Parry Sound	Jno. A. Johnson	June 13th	Fred. Desome	Penetanguishene	Fishing in the inland lake.
	C. W. Burns				
Peterborough	J. W. Wedlock				
Renfrew	Robt. R. Smith	Jan. 16th			
	"	Sept. 7th	Jos. Switzer	Ferguson	Illegal fishing
	"	July 6th			
	Aaron Briggs	Dec. 5th	Geo. Atchison	South Alice	Killing deer out season.
	"	Jan. 6th	Samuel Biggs	Pembroke	"
Simcoe	Jno. Hines	Nov. 5th	Mr. Gero	Lovering	Fishing in inland waters.
	"	"	" Ferthaugh	"	"
Victoria	Jno. A. Ellis	Dec. 7th	B. Sharpless	Gelert	Killing deer out of season.
	"	"	A. Hoyle	Balsam Grove	"

BY DEPUTY-WARDENS.—*Continued.*

Was Offender arrested or summoned.	When tried.	Name of Magistrate.	Result of Case.	Nets, traps or illegal appliances seized during season of 1892.
Summoned	Napanee	Jas. Daily	Fined $5.	
"	"	"	" $5.	
"	"	"	" $5.	
"	"	"	" $5.	
"	"	"	" $5.	
"	"	"	" $10.	
"	"	"	" $12.	
Summoned	Ingersoll	Police Magistrate Chadwick	Dismissed. (In this case it was held by the magistrate that the waters in question were not Provincial waters and that the law therefore was not applicable.)	
Summoned	Bracebridge	James Boyce	Fined $20.	
"	"	"	" $20.	
"	"	"	" $20.	
"	"	"	" $20.	
"	"	"	Dismissed	
"	"	"	"	
"	Tp. of Monck	C. F. Butler	"	
				Destroyed 3 traps.
				Shot 1 hound chasing deer
				Destroyed 2 gill nets.
Summoned	Franklin	E. J. Gouldie	Fined $10.	
"	"	"	" 10.	
"	"	"	" 10.	
"	"	"	" 10.	
"	"	"	" 20.	
"	"	"	" 10.	
"	Huntsville	R. Scarlett	" 20 and costs.	
"	"	"	" 20 "	
"	"	"	" 20 "	
"	"	"	" 20 "	
				Destroyed fish net.
				Seized and destroyed 2 nets.
Summoned	Woodstock	J. G. Field	Dismissed.	
Arrested	Georgian Bay	Jno. A. Johnson	$10	Captured nets found in Spider Lake.
"				Captured 1 fish net.
				Destroyed a large number of traps.
				Captured 7 nets.
Summoned	Renfrew	George Eady	$10.	
				Confiscated 1 net.
Arrested	Alice	Thos. Heenan	$20 and costs.	
"	Pembroke	L. E. Mitchell	$20 and costs.	
Summoned.	Lovering	Messrs. Kitchen & Lovering.	$5 and costs	Seized a number of nets.
"	"	"	$5 and costs.	
"	Fenelon Falls	Jno. A. Ellis	$20.	
"	"	"	$20.	

TABLE OF CASES PROSECUTED

District or County.	Name of Prosecutor.	Date. 1892.	Name of Offender.	Address.	Offence Charged.
Victoria	T. J. Wills	Nov. 21st	Jno. Mulnox	Galway	Killing fawn
	"	Dec. 9th	Albert Bottom	Bobcaygeon	Hunting on the Lord's day.
	"	"	William Bottom	"	"
	"	"	W. B. Read	"	"
	"	"	Wm. Birdsall	"	"
	"	"	Guy Kimble	"	"
	"	Dec. 30th	Wm. Dunbar	Kinmount	"
	"	"	Jos. Clements	Galway	"
	"	"	Geo. Dunbar	"	"
	"	"	Cristopher Graney	"	"
	"	"	Fred. Dudman	"	"
	"	"	Jas. Gaffagan	Lorneville	Killing 2 fawns.
Welland	Geo. Barnhart	Sept. 11th	Jno. Reinhart	Netherby	Shooting out of season.
Wellington	George Smith	June 1st	Geo. O. Atkinson	Guelph	Illegal fishing
Waterloo	Henry Gildner	Oct. 13	A. Bossart	Berlin	Sunday shooting.
	John Devitt	"	Jacob Wrig	"	"
	"	Nov. 15	Christian Henry	Waterloo	"
	"	"	Alfred Snyder	"	"
	"	Nov. 16	Solomon Beatty	"	"
	"	Nov. 25	Jno. Liebler	Erbsville	"
York	Hume Brown	Dec. 18	Harry Webb	Toronto	Selling deer out of season.
	"	"	John Mallon	"	"
	"	"	E. G. McConkey	"	"
	"	"	Thos. Clayton	"	"
	"	"	H. Brown	"	"
	"	"	Kelly Bros	"	"
	"	"	C. H. Waller	"	"
	"	"	C. H. Bolton	"	"

BY DEPUTY-WARDENS.—*Concluded.*

Was Offender arrested or summoned.	Where tried.	Name of Magistrate.	Result of Case.	Nets, traps or illegal appliances seized during season of 1892.
Summoned	Bobcaygeon	S. W. Crabtree	$10.	
"	Galway	J. Seymor	Fined $5.	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	Peterborough	P. M. Edmison	"	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	Fined $20.	
Summoned	Welland	E. R. Hellems	Fined $20.	
Summoned	Guelph	Mr. Saunders	Fined $5 and costs.	
Summoned	Berlin	J. A. Mackie	Fined $1 and costs.	
"	"	"	" $2.	
"	"	"	" $2.	
"	"	"	" $2.	
"	"	"	" $2.	
"	"	"	" $5.	
Summoned	Toronto	John Baxter	$12.50 and costs.	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	Discharged.	
"	Toronto	"	$12.50 and costs.	
"	"	"	"	

No. 77.

Return to an Order of the House of the third day of May, 1893, for a Return of copies of all correspondence between the License Inspector of North Brant, or other parties, and the License Department, of any member of the Government, in connection with the application of William T. Jenkinson for a tavern license in polling sub-division No. 10, Brantford Township. Presented to the Legislature, 8th May, 1893. Mr. *McCleary*. (*Not printed.*)

RETURN

To an Order of the Legislative Assembly, dated the 19th April, 1893, for a Statement shewing expenditure on Colonization, Government or County Roads and Bridges by the Crown Lands Department, in the Counties of Victoria, Peterborough, Hastings, Addington and Frontenac during the year 1892, with the location and amount expended on such Roads and Bridges, and giving the name of the foreman in charge and the amount received by such foreman for his own services out of each expenditure.

By Command.

J. M. GIBSON,
Secretary.

Toronto, 8th May, 1893.

STATEMENT—"Shewing expenditure on Colonization, Government or County Roads and Bridges, by the Crown Lands Department, in the Counties of Victoria, Peterborough, Hastings, Addington and Frontenac during the year 1892, with the location and amount expended on such Roads and Bridges, and giving the name of the foreman in charge, and the amount received by such foreman for his own services out of each expenditure."

Name of Work.	Location.	Amount expended.	Name of Foreman.	Amount received by Foreman for his services.
	County of Victoria.	$ c.		$ c.
Dalton, 25 & 26 S. L. Road	From con. 9, Dalton, northwards 2¼ miles	395 25	Geo. Campbell	98 00
Somerville "	Between cons. 8 and 9, Somerville, across lots 5 to 8	125 08	Thos. Byrne	22 00
	County of Peterborough (East and West).			
Belmont "	Between Havelock Station, C.P.R., and Methuen Road	410 62	R. Anderson	12 00
	And Municipal grant	150 00	S. Hubble	22 50
			A. Munro	16 75
			S. Wannamaker	18 00
Bobcaygeon "	Between Victoria and Peterborough, S. of Kinmount	774 68	Charles Coben	30 00
Booth "	Lot 32, con. 14, to lot 26, con. 16, Anstruther	420 59	F. Elmhirst	47 50
Buckhorn "	Six miles in Township of Cavendish	1,198 29	Robt. Shaw	81 00
Buckhorn and Burleigh Road	South portions of each road	173 25	M. E. Sanderson	28 00
	And Municipal grant	150 00		
Burleigh "	Through Burleigh and Chandos	488 10	F. Elmhirst	42 50
Cavendish "	From lots 20 and 21, cons. 15 to 19, and from lot 3, eastward along 18th con., Cavendish	608 21	Wm. Dunbar	48 00
Dummer, 9th Con. "	From lot 6 to lot 28 in 9th con. Dummer	207 00	C. Crowe	19 50
	And Municipal grant	100 00	C. Nicoll	16 50
			R. Taylor	4 50
Galway and Cavendish "	Between cons. 14 and 15, Galway and Cavendish, and short spur to Salmon Lake	859 85	C. Coben	22 50
Gannon's Narrows "	Road in Ennismore	102 30	C. O'Connor	12 00
	And Municipal grant	100 00		
Methuen "	In Township of Chandos	350 03	F. Elmhirst	82 50
Nogey's Creek "	Lot 25, con. 7, to lot 31, Harvey	313 67	Robt. Shaw	15 00
North Harvey "	Lot 10, east side, con. 8 to con. 7, and lot 20, con. 10, westward, all in Tp. of Harvey	763 82	"	63 00
Queen's Line "	Between lots 15 and 16, Galway, through con. 10 to 12	322 49	Wm. Dunbar	6 00
Reid "	Between cons. 15 and 16, Galway	219 23	C. Coben	10 00
	And Municipal grant	150 00	W. Brooks	26 62
Round Lake "	Through cons. 8 to 10 and lots 27, 28, Belmont	208 06	W. Marshall	30 00
	And Municipal grant	100 00		

Sandy Lake "	Between Sandy Lake and Hall's Bridge, Harvey	113 28	R. Shaw	21 00
	And Municipal grant	100 00		
Stony Lake "	Between lots 29 and 30, cons. 7 to 12, Dummer	106 75	D. Drain	7 50
	And Municipal grant	50 00	C. Crowe	7 50
	Hastings County (North).			
Carlow Bridge	On Carlow Road, between lots 25 and 26, Tp. of Carlow	787 66	J. Campbell, jr.	116 00
Hastings Road	Between Rathbun Station and Bancroft	796 46	D. Cavanagh	150 00
		62 00	J. Fitzgerald	
New Aylow Bridge	Over Papineau Creek, lot 6, con. 13, Carlow	498 98	F. Train	123 00
York River "	Hastings Road in Herschel, over Y River	508 53	D. Kavanagh	87 50
	Addington County.			
Abinger and Miller Road	Between Townships of Abinger and Miller	498 13	Wallace Mallory	83 00
Addington Road	Between Kaladar and Cloyne	848 00	A. P. Wickware	115 00
Arden "	In Kennebec and Olden Townships	501 06	Wm. Lane	92 00
		500 00	Jas. Tallon	90 00
Clare River Bridge	On Addington Road	800 00	Hiram Keech	128 00
		43 94		
Miss. Juno. "	Lot 21, between cons. 1 and 2, Palmerston	412 89	Wm. Donaldson	72 00
Mountain Grove Road	Tp. of Olden, lots 1 to 13, cons. 2 and 3	397 13	M. Price	69 00
Trafford and Tamworth Road	Tp. of Sheffield, lots 2 and 3, con. 13	394 77	L. Whelan	74 00
	Frontenac County.			
Devil Lake Bridge	On Perth Road, near Bedford Mills, Bedford	400 00	Thos. O'Connor	65 00
		26 40		
Loborough Lake Bridge	On Kingston and Perth Road, Loughborough	200 00	J. Daly	18 00
		95 77		
Stone Dam and Desert Lake Road	From lot 8, con. 11, Portland, to lot 3, con. 14, Loughborough	808 66	W. H. Reynolds	121 25
West Rideau Lake Bridge	On lot 19, con. 9, Bedford	590 51	Thos. O'Connor	88 00

DEPARTMENT OF CROWN LANDS,
8th May, 1893.

AUBREY WHITE,
Assistant Commissioner

RETURN

To an Order passed by the Legislative Assembly on the 23rd day of March, 1892, for a Return shewing amounts of defalcations made by the Treasurers of any of the Municipalities in the Province of Ontario during the years 1871 to 1891, both inclusive. Shewing also, the amounts any of said Municipalities have lost during the same time for want of sufficient sureties being given by said Treasurers, and also shewing the number of Commissions of Enquiry into the finances of Municipal Corporations issued during said years under section 383 of the Municipal Act.

J. M. GIBSON,
Secretary.

Provincial Secretary's Office,
Toronto, May 9th, 1893.

RETURN

Shewing the amounts of defalcations made by the Treasurers of Municipalities during 1871 to 1891, both inclusive, and the amounts of loss by Municipalities for want of sufficient sureties. Also, the number of Commissions of Enquiry into the finances of Municipal Corporations, under section 383 of the Municipal Act, issued during the same period.

SCHEDULE :— PAGE.

Amounts of defalcations and losses:
Cities 4
Towns 4
Villages 4
Counties 4
Townships 5
Number of Commissions issued 5

Amounts of defalcations by Treasurers of Municipalities and of losses by Municipalities for want of sufficient sureties from 1871 to 1891, both inclusive.

Municipalities.	Amount of defalcations.	Amount of Losses.	Remarks.
	$ c.	$ c.	
CITIES :—			
Belleville	23,000 00	23,000 00	
London	79,965 00		The Clerk's return gives no particulars as to amount of loss, if any.
Total	102,965 00	23,000 00	
TOWNS :—			
Berlin	1,070 90		
Brockville	2,459 49	2,459 49	Amount of default. $1,790 48; " law costs, 669 01; $2,459 49
Brampton	1,028 35	228 34	Sureties ample, but part of claim remitted.
Mitchell	960 00		
Morrisburg	1,382 44		
Sandwich	3,000 00		
Windsor	2,292 00	1,461 15	
Total	12,193 18	4,148 98	
VILLAGES :—			
Alexandria	479 70		
Elora	7,546 76		The Council holds security for full amount.
Fenelon Falls	3,124 00	1,800 00	
Gananoque	1,800 00	1,400 00	
Weston	427 57	264 06	
Total	13,378 03	3,464 06	
COUNTIES :—			
Bruce	24,976 64	15,971 18	
Elgin	4,415 00	4,415 00	
Essex	22,958 57	11,479 29	Council accepted settlement at 50 cents on the dollar. The whole of that not yet collected.
Kent	6,006 93		Sureties say books not properly audited. Claim still pending.
Leeds and Grenville			In 1881, irregularities discovered in Treasurer's accounts. His bondsmen settled with County Council by paying $12,000.
Lennox and Addington			Treasurer in default in 1879. Sureties paid amount of bond, $12,000. Clerk does not report amount of loss, if any.
Ontario	17,771 98	15,260 33	
Prince Edward	1,020 55	1,020 55	
Renfrew	18,922 55		
Stormont, Dundas and Glengarry	14,215 50		
Total	90,287 17	48,146 35	
TOWNSHIPS :—			
Adjala	4,500 00	4,500 00	
Bertie	4,500 00	4,500 00	Sureties paid amount of costs.
Biddulph	822 89		
Brooke	1,399 58	588 30	
Burford	980 00	800 00	
Caradoc	2,400 00	1,200 00	
Culross			Defalcation, but amount not determined.

Amounts of defalcations by Treasurers of Municipalities, etc., etc.—*Continued.*

Municipalities.	Amount of Defalcations.	Amount of Losses.	Remarks.
TOWNSHIPS.—*Continued.*	$ c.	$ c.	
Charlotteville	4,451 46	3,116 00	
Downie	369 11	369 11	
Ekfrid	2,500 00	1,500 00	
Euphemia	5,307 98		
Fenelon	300 50	300 00	
Flamborough, West	1,075 63		
Garafraxa, West	7,869 64	7,869 64	
Haliburton	400 00		
Hilliery	3,793 48	3,460 14	
Houghton	2,000 00	2,000 00	
Kingston	4,000 00		
Luther, West	700 00		
Minto	634 03		
McDougall	800 00	800 00	
Morris	2,127 99		
Morteagle and Herschel	259 13	259 13	
Muskoka	753 31	353 31	
Oakland	300 00	556 00	$256 was expended in an unsuccessful suit against sureties.
Russell	735 00		
Sombra	652 00	652 00	
Somerville	1,300 00		
Total	54,931 23	32,823 63	

STATEMENT shewing the number of Commissions of Enquiry into the finances of Municipal Corporations issued during the years 1871 to 1891, both inclusive, under section 383 of the Municipal Act.

Date of Commission.	Name of Municipality.
1871 March 11	Town of Cornwall.
1875 July 29	Township of Cumberland.
1876 January 21	Town of Belleville.
1879 September 13	Town of Cornwall.
1879 October 2	Township of West Garafraxa.
1879 December 15	Township of Houghton.
1881 June 13	Township of Moncton.
1881 September 30	Township of Sombra.
1882 March 28	Township of Rochester.
1883 May 30	Village of Brockton.
1887 August 22	Township of Culross.
1887 October 11	Township of Culross.
1889 August 13	Township of McKillop.
1889 November 21	Township of Charlotteville.

No. 80.

Return to an order of the House of the nineteenth day of April, 1893, for a Return of copies of all correspondence in connection with an application for a new Bridge over York Branch River, between lots 20 and 21, in the Township of Carlow, in the County of Hastings, during the year 1892, and all papers or memoranda connected therewith. Presented to the Legislature, 10th May, 1893. Mr. *Wood* (*Hastings*). (*Not printed.*)

STATEMENT

Of the Returns forwarded to the Office of the Provincial Secretary of all the Fees and Emoluments received by the Registrars of Ontario for the year 1892, made in accordance with the provision of the Revised Statutes of Ontario, 1887, chap. 114, sec. 100, with which are contrasted receipts of the same nature in the years 1890 and 1891.

Presented to the Legislative Assembly.

By Command,

J. M. GIBSON,

Secretary.

Provincial Secretary's Office,
Toronto, May 12th, 1893.

STATEMENT OF

Forwarded to the Office of the Provincial Secretary of all the Fees and Emoluments provisions of the Revised Statutes of Ontario, 1887, chapter 114, section 100,

Office.	Registrar.	1 Number of Municipalities in the Division.	2 Number of instruments registered during the year 1892.	2a Number of instruments registered during the year 1891.	3 Number of uncopied and uncompared instruments on 31st December, 1892.	Amount of fees receiv'd under sub-sections 1 to 12 of section . 4 Total for registrations under sub-sections 1, 6, 10, 12, declaration of partnerships and any other registrations not included in the Act.	5 For searches, sub sections 2, 3, 10.	6 For abstracts, sub-sec. 4.
						$ c.	$ c.	$ c.
Algoma	R. A. Lyon	9	615	570	20	896 40	201 90	126 63
Brant	T. S. Shenston	7	1,862	1,969	32	2,457 60	313 60	264 65
Bruce	Donald Sinclair	27	3,251	3,594	439	4,341 30	219 60	855 40
Carleton	P. J. Coffey	12	2,061	2,047	38	2,782 05	279 10	507 25
Dufferin	William McKim	8	1,488	1,552	574	2,343 95	304 65	569 30
Dundas	Thomas McDonald	8	985	1,031	.....	1,267 55	126 30	79 90
Durham, E. R	George C. Ward	5	718	767	30	1,046 76	130 40	112 00
Durham, W. R	J. W. McLaughlin	5	582	749	10	806 35	97 95	143 57
Elgin	Jas. N. Coine	13	3,155	2,874	67	4,354 21	530 05	318 53
Essex	J. Wallace Askins	27	4,637	4,111	1,994	5,818 54	1076 95	877 65
Frontenac	J. D. Thompson	18	1,313	1,263	143	1,726 20	319 10	217 20
Glengarry	John Simpson	7	835	853	3	1,076 55	140 54	145 90
Grenville	Patrick McCrea	9	1,091	1,156	83	1,447 75	99 50	184 10
Grey, N. R	Robt. McKnight	12	2,004	2,175	19	2,748 30	245 15	554 25
Grey, S. R	Thos. Lauder	8	2,018	1,647	113	2,744 30	88 42	353 75
Haldimand	William Parker	13	1,278	1,340	30	1,691 15	338 10	275 25
Haliburton	E. C. Young	9	176	242	12	228 00	19 25	57 65
Halton	Donald Campbell	9	1,229	1,282	.....	1,629 50	323 25	180 80
Hastings	Henry W. Day	30	2,661	2,402	123	3,589 40	505 50	800 75
Huron	James Dixon	24	3,610	3,314	65	4,647 40	259 70	819 20
Kent	Peter D. McKellar	18	4,114	3,770	152	5,421 15	528 10	814 90
Kingston (C.)	J. P. Gildersleeve	1	681	1,025	15	872 45	166 47	95 24
Lambton	A. McLean	20	4,816	4,480	46	6,119 85	978 77	576 15
Lanark, N. R	John Menzies	8	663	644	4	890 10	66 55	34 55
Lanark, S. R	James Bell	10	1,119	1,183	12	1,446 60	175 90	109 80
Leeds	Wilmot H. Cola	15	2,033	2,067	.....	2,737 95	251 60	446 17
Lennox and Addington	Stephen Gibson	16	1,270	1,013	120	1,684 75	144 30	199 45
Lincoln	James G. Currie	14	1,657	1,579	148	2,415 15	261 15	587 45
London (C.)	Wm. C. L. Gill	1	1,506	1,504	25	2,071 50	368 80	278 57
Manitoulin	D. R. Springer	28	266	220	.....	368 75	16 45	65 20
Middlesex, N. & E	W. C. Noble	14	2,140	2,253	75	2,889 00	330 45	299 85
Middlesex, W	Stephen Blackburn	9	1,242	1,035	137	1,630 40	201 30	322 85
Muskoka District	J. E. Lount	24	850	903	45	1,134 60	127 80	335 20
Nipissing District	William Doran	52	414	419	20	557 60	6 25	14 00
Norfolk	A. J. Donly	12	2,019	1,817	2	2,851 80	378 85	378 60
Northumberland, E. R.	A. E. Mallory	9	1,140	1,605	98	1,640 20	175 20	620 35
Northumberland, W. R.	M. F. W. Eyn	5	600	752	52	893 90	92 85	278 65

THE RETURNS

received by the Registrars of Ontario for the year 1892, made in accordance with the with which are contrasted receipts of the same nature in the years 1890 and 1891.

the tariff as allowed by 95 of the Registry Act.			9	9a	9b	10	11	12	13	14
8 Special Receipts.										
For Certificates, sub section 6, and affidavits and oaths, sub section 9.	Special work not covered by next column.	For work connected with the transfer of instruments paid for by the County Treasurer, sub sec. 7.	Gross amount of fees, exclusive of column 8, 1892.	Gross amount of fees proper, 1891.	Gross amount of fees proper, 1890.	Total amount of fees and emoluments earned by Registrars during the year 1892, by virtue of his office.	Disbursements during 1892, in connection with the office of Registrar.	Amount belonging to Municipality under section 107.	Whether paid to Treasurer, and when.	Net income of Registrar.
$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.		$ c.
101 45	800 00	salary	1,826 38	1,120 46	1,158 25	2,126 38	538 30	.....	.....	1,588 08
54 45	177 80	.....	3,090 30	3,100 25	3,663 25	3,268 10	941 40	68 06	Paid Jan. 3,'93	2,269 74
50 50	.....	.....	5,466 80	5,996 08	6,931 03	5,466 80	2,474 51	983 40	" July 11 "	2,008 89
69 55	.....	.....	3,637 95	3,798 10	4,150 91	3,637 95	963 18	191 38	" Jan. 12 "	2,674 77
31 30	107 00	.....	3,239 20	2,883 55	3,354 20	3,346 20	1,091 75	97 84	" before Ap'l 14, 1893..	2,254 45
5 75	.....	.....	1,479 50	1,613 40	1,738 90	1,479 50	613 00	.....	.....	866 50
.....	.....	.....	1,289 16	1,267 57	1,131 50	1,289 16	500 00	.....	.....	789 11
4 60	.....	.....	1,052 41	1,174 65	1,225 83	1,052 41	520 00	.....	.....	532 41
2 50	275 81	.....	5,206 29	4,647 51	5,156 85	5,482 10	975 51	853 15	Jan. 14, '93....	3,653 44
71 75	.....	.....	7,844 89	7,302 66	8,188 78	7,844 89	2,403 06	2,172 44	Paid May, 93	3,269 39
.....	.....	.....	2,262 50	2,248 65	2,245 45	2,262 50	341 30	.....	.....	1,921 20
49 25	.....	.....	1,412 64	1,363 90	1,571 25	1,412 64	330 75	.....	.....	1,081 89
11 25	.....	.....	1,742 60	1,929 70	1,931 95	1,742 60	860 00	.....	.....	882 60
43 50	1 50	.....	3,591 20	3,852 85	5,167 75	3,592 70	910 19	177 81	Paid Jan. 3, '93	2,504 70
68 00	.....	.....	3,254 47	2,677 35	2,835 83	3,254 47	1,064 84	101 09	" " 6 "	2,088 63
13 75	.....	.....	2,318 25	2,347 42	2,331 82	2,318 25	1,030 00	.....	.....	1,288 25
6 75	50 00	.....	311 65	381 15	347 41	361 65	.....	.....	.....	361 65
6 50	.....	.....	2,140 05	2,262 85	2,545 60	2,140 05	950 31	.....	.....	1,189 74
48 05	.....	.....	4,943 70	4,786 60	5,155 75	4,943 70	1,432 10	721 85	Paid Jan. 11,'93	2,789 75
50 50	.....	.....	5,776 80	5,708 30	6,367 55	4,776 80	2,451 00	1,138 40	" July 14 "	2,187 40
37 50	.....	.....	6,801 65	6,442 30	7,195 15	6,801 65	2,275 44	1,650 82	" " 23 "	2,875 39
.....	.....	.....	1,134 16	1,665 43	1,667 23	1,134 16	587 28	.....	.....	583 63
.....	.....	.....	7,674 77	7,404 05	8,148 65	7,674 77	2,854 44	2,087 39	Paid Jan. 11,'93	2,757 94
24 90	.....	.....	1,016 10	1,059 95	1,152 51	1,016 10	112 25	.....	.....	903 75
9 00	200 00	.....	1,741 30	1,906 25	2,154 24	1,941 30	794 30	.....	.....	1,147 00
24 75	.....	.....	3,460 47	3,512 35	3,821 06	3,460 47	1,408 25	142 09	Contra account.	1,911 13
8 10	.....	.....	2,037 60	1,714 40	1,858 50	2,037 60	577 80	.....	.....	1,459 80
66 45	.....	.....	3,380 10	3,036 45	3,298 30	3,330 20	424 90	116 06	Pd. before May 1, '93.....	2,789 24
.....	.....	.....	2,678 87	2,730 90	2,624 80	2,678 87	660 09	17 89	Paid Jan. 7, '93	2,018 78
16 85	.....	.....	467 25	388 45	419 63	467 25	22 06	.....	.....	445 19
10 25	.....	.....	3,629 55	3,618 00	4,266 50	3,629 55	665 00	185 40	Paid Jan. 14,'93	2,779 15
59 85	.....	.....	2,214 40	1,879 60	2,042 10	2,214 40	547 00	.....	.....	1,667 40
53 80	.....	.....	1,681 40	1,760 40	1,789 40	1,681 40	425 00	.....	.....	1,256 40
1 25	6 00	.....	579 10	635 00	686 67	585 10	.....	.....	.....	585 10
46 05	.....	.....	3,655 30	3,289 05	3,806 20	3,655 30	1,500 00	196 59	Contra account.	1,958 71
11 50	78 00	.....	2,447 30	2,787 96	3,061 60	2,525 38	733 00	.....	.....	1,792 38
1 00	.....	.....	1,266 40	1,391 20	1,542 50	1,266 40	303 30	.....	.....	963 10

STATEMENT OF THE

Forwarded to the Office of the Provincial Secretary of all the fees and emoluments provision of the Revised Statutes af Ontario, 1887, chapter 114, section 100,

Office.	Registrar.	1 Number of Municipalities in the Division.	2 Number of instruments registered during the year 1892.	2a Number of instruments registered during the year 1891.	3 Number of uncopied and uncompared instruments on 31st December, 1892.	Amount of fees receiv'd under sub-sections 1 to 12 of section 4 Total for registrations under sub-sections 1, 6, 11, 12, declarations of partnerships and any other registrations not included in the Act.	5 For searches, sub-sections, 2, 3, 10.	6 For abstracts, sub-section 4.
						$ c.	$ c.	$ c.
Ontario	John Ham Perry	17	2,133	2,418	173	2,916 60	167 05	397 45
Ottawa (C.)	Alexander Burritt	1	1,985	2,306	25	2,811 35	584 80	284 05
Oxford	Geo. W. Pattullo	16	3,088	2,957	173	4,204 85	336 20	638 25
Parry Sound District	Thos. Kennedy	44	589	474	15	851 35	168 60	337 60
Peel	T. G. Sheppard (acting R.)	8	1,387	1,507	671	1,944 00	210 45	363 95
Perth, N. R	D. D. Hay	9	1,730	1,746	62	2,159 90	202 00	349 75
Perth, S. R	Patrick Whelihan	7	1,009	858	52	1,183 10	78 30	220 40
Peterborough	B. Morrow	19	2,140	1,999	155	2,960 55	374 90	607 40
Prescott	John Higginson	9	1,087	1,105	95	1,558 50	105 45	230 40
Prince Edward	Walter McKenzie	9	980	1,095	316	1,297 72	155 77	164 35
Rainy River District	Frank J. Apjohn	3	276	293	2	428 70	15 50	92 36
Renfrew	Andrew Irving	26	1,726	1,588	.....	2,480 00	408 60	189 35
Russell	James Keays	6	784	843	.....	1,048 72	11 85	317 55
Simcoe	Samuel Lount	26	4,226	4,585	49	5,891 60	702 10	1319 85
Stormont	J. C. Alguire	5	1,049	1,089	33	1,387 15	229 65	172 50
Thunder Bay District	J. M. Munro	25	642	779	15	960 80	224 00	295 50
Toronto, E	Peter Ryan	1	6,385	7,742	45	9,626 20	1831 15	1271 05
Toronto, W	Charles Lindsay	1	7,650	9,852	24	11,162 90	2571 25	913 10
Victoria	Chas. D. Barr	18	1,820	1,974	378	2,455 95	388 50	530 85
Waterloo	Isaac Master	13	2,238	2,509	70	2,999 00	276 95	408 30
Welland	Jas. E. Morin	15	2,251	2,335	45	3,295 45	1315 70	965 05
Wellington, N. R	John Anderson	11	1,447	1,421	58	1,923 65	169 50	602 25
Wellington, S. & C. R.	N. Higinbotham	11	1,756	1,625	213	2,341 45	354 25	300 50
Wentworth	Lewis Springer	10	4,450	4,791	194	5,918 60	879 78	1358 70
York, E. & W. R.	John Ridout	13	5,764	6,892	45	6,789 70	1342 50	768 15
York, N. R	Jas. J. Pearson	9	1,293	1,198	218	1,821 10	185 65	346 65

RETURNS.—*Concluded*

received by the Registrars of Ontario for the year 1892, made in accordance with the with which are contrasted receipts of the same nature in the years 1890 and 1891.

the tariff as allowed by 95 of the Registry Act.			9	9a	9b	10	11	12	13	14
7 For certificates, sub-section 5, and affidavits and oaths, sub-section 9.	8 Special Receipts. Special work not covered by next column.	8 Special Receipts. For work connected with the transfer of instruments paid for by the County Treasurer, sub-section 7.	Gross amount of fees exclusive of column 8, 1892.	Gross amount of fees proper, 1891.	Gross amount of fees proper, 1890.	Total amount of fees and emoluments earned by Registrar during the year 1892, by virtue of his office.	Disbursements during 1892 in connection with the office of Registrar.	Amount belonging to Municipality under section 107.	Whether paid to Treasurer, and when.	Net income of Registrar.
$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c		$ c.
42 50	.....	.....	3,323 60	3,958 20	3,962 95	3,523 60	831 39	157 08	Paid Jan. 16, '93	2,535 13
103 35	.....	.....	3,783 55	4,605 30	4,436 45	3,783 55	1,018 10	235 06	" " 11 "	2,530 39
18 00	82 30	.....	5,197 30	5,053 95	5,744 60	5,279 60	1,328 03	889 80	" " 12 "	3,061 77
45 25	.....	.....	1,402 80	1,227 35	1,443 55	1,402 80	326 65	.....	.....	1,076 15
81 95	.....	.....	2,600 35	2,687 20	2,966 35	2,600 35	895 00	.....	.....	1,705 35
15 25	.....	.....	2,726 90	2,826 00	3,088 60	2,726 90	1,018 80	22 69	Paid Jan. 10, '93	1,708 10
38 05	.....	.....	1,519 85	1,398 95	1,749 50	1,519 85	781 35	.....	.....	738 50
12 50	.....	.....	3 955 35	8,903 80	4,063 50	3,955 35	1,043 00	286 60	Paid Jan. 14, '93	2,625 75
35 00	.....	.....	1,929 35	1,893 77	2,127 73	1,929 35	386 50	.....	.....	1,542 85
3 25	.....	.....	1,621 09	1,776 12	1,902 49	1,621 09	800 00	.....	.....	821 09
74 60	.....	.....	611 65	579 85	530 12	611 65	.....	.....	.....	611 65
23 75	11 15	.....	3,101 70	2,754 40	3,038 50	3,112 85	1,000 00	72 60	Paid Dec. 31, '92	2,040 25
22 20	.....	.....	1,400 32	1,526 60	1,992 40	1,400 32	250 00	.....	.....	1,150 32
78 75	.....	.....	7,992 30	8,229 70	8,256 76	7,992 30	3,234 93	2,246 15	Paid Jan. and March, '93	2,511 22
10 00	.....	.....	1,799 30	1,773 64	2,005 50	1,799 30	902 90	.....	.....	896 40
.....	.....	.....	1,480 30	1,614 30	1,502 10	1,480 30	539 00	.....	.....	941 30
198 25	.....	1,870 76	12,926 65	14,763 55	17,163 15	24,797 41	6,260 21	4,713 32	Paid Jan. 14, '93	3,823 38
124 70	1,948 00	.....	14,771 95	18,947 30	22,106 45	16,719 95	6,582 94	5,635 98	" " 16 "	4,501 02
.....	.....	.....	3,375 30	1,591 54	3,480 50	3,375 30	888 70	125 06	" " 14 "	2,361 54
16 75	.....	.....	3,701 00	4,342 25	4,513 70	3,701 00	1,406 40	210 30	" " 16 "	2,084 30
6 75	100 00	.....	5,582 95	4,723 81	3,787 70	5,682 95	1,135 94	1,041 47½	" " 4 "	3,505 53½
46 75	.....	.....	2,742 15	2,720 15	2,841 90	2,942 15	850 00	24 20	" " "	1,892 15
59 15	.....	.....	3,055 35	2,717 25	2,838 25	3,055 35	739 35	61 07	" " 16 "	2,254 93
13 50	.....	.....	8,170 58	9,270 05	9,994 35	8,170 58	2,388 00	2,335 29	" Feb. 13, '93	3,447 29
47 00	.....	.....	8,947 35	12,366 95	15,628 75	8,947 35	5,706 42	2,147 67	" Jan. 4 "	1,084 50
.....	.....	.....	2,353 40	2,130 10	2,411 60	2,353 40	854 00	.....	.....	1,499 40

ANNUAL REPORTS

OF THE

POULTRY AND PET STOCK ASSOCIATIONS

OF THE

PROVINCE OF ONTARIO

1892

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY.

TORONTO:
PRINTED BY WARWICK & SONS, 68 AND 70 FRONT STREET WEST.
1893.

ANNUAL REPORT

OF THE

POULTRY ASSOCIATION OF ONTARIO.

To the Honorable the Minister of Agriculture:

SIR,—I have the honor of presenting this the Report of the nineteenth annual exhibition held by the Poultry Association of Ontario in the city of Hamilton, on January 2nd to 6th, 1893, and enclose herewith the essays read at the annual meeting, together with a copy of the minutes of said meeting and the subsequent meeting of the directors.

The principal feature of this exhibition was the marked success which attended it. In respect to the number of the exhibits, they were ahead of any former show held by the Association, and the quality of the birds was, I am informed, decidedly equal to, if not slightly in advance of, last year. In many of the varieties there was a large increase, and in others a slight decrease, leaving the total number of specimens on exhibition 1,298, besides at least 40 others which we could have had but were refused by me on account of the lateness of making entries. This action caused some feeling at first on the part of the delinquents and by a few others who thought it to be very arbitrary. Yet after carefully considering the facts in connection with the practice of receiving entries at all times, and the utter impossibility of having a well-regulated show if continued; and having explained to them the great possibilities of an unlimited amount of fraud being perpetrated by doing so, all the members present decided the new course to be the only proper one, and a resolution instructing the Secretary to continue it for the future received unanimous support.

The number of exhibitors shows an increase of 12 per cent. over last year, many of them being breeders showing this year for the first time. The territory covered by our exhibitors is of large proportions, reaching as it does from the city of Montreal on the east to the Detroit river on the west, and representing a majority of the counties situated between these points.

These circumstances are very encouraging to us as an Association, and will no doubt please the Department of Agriculture, proving as it does most conclusively that our labors are not in vain, that good results are manifested throughout the entire length and breadth of this Province, and that the annual appropriation given to us is being expended in a profitable manner and fulfilling the object for which it was given.

The essays read were productive of an animated discussion, and many were the useful points brought out which will prove a great benefit to those who heard them. The merits of Mr. Duff's essay were freely discussed, the members being invited to do so, and many were the kind remarks passed upon it. The writer was highly complimented for the great care he had taken in compiling it. Most of the speakers agreed with his ideas for housing and feeding in a general way, but took exception to that portion relating to the coloring of white fowls by allowing them to eat yellow corn. So strong was the opposition to this theory that, in my opinion, we must decide him a little astray on this point, and that plenty of fresh air, little sunlight, clean water and surroundings will keep the feathers white.

A member asked for the best cure for canker, and the mode of treatment. Mr. Allan Bogue, of London, who has had over forty years' experience in poultry raising, recommended a solution of nitrate of silver—45 grains to the ounce. Mode of treatment: Clean the mucus from the mouth, tongue and windpipe carefully. This will cause a bleeding, which it will be necessary to wash away thoroughly with soft water and castile soap, then dry out the mouth with a sponge. Make a small swab with a piece of sponge, covering the end of handle so as not to scratch the mouth or windpipe. Moisten the affected parts well with the solution. The first application is sure to kill the disease, but may require two or three subsequent applications to clean it up thoroughly. This solution is a sure cure for chicken pox, by applying it to the affected parts in the same manner as above described.

A cure for roup was also asked for, and Mr. Wm. McNeil, of London, the largest breeder in Canada, answered as follows: A solution of acetic-acid, sugar of lead and powdered alum in equal parts. Mode of treatment: Press the nostrils gently until the whole of the matter is squeezed out; then drop ten to fifteen drops in each nostril and work it with the fingers.

The action of the directors in offering prizes for dressed poultry was not appreciated by the members as it should have been, there being very few specimens on exhibition, and none of them of what is termed first quality.

It is considered by some that we are not yet ready for this, and an effort will be made to prepare the way by substituting therefor a class for cross-bred fowls, which will in short time supply not only the exhibition purposes but one that will be larger and more suitable for table use, and a much better egg producer.

It is the intention to offer prizes for the cross-bred fowls, and also for the best essays on subjects to be selected by the Directors; and the advisability of inviting the members to send in in writing any questions relating to the poultry industry they wish information about is to be taken up at our next meeting. By following such lines as these and having them fully reported through the proper medium, we are sure to be of still greater service to the younger breeders and farmers generally than we have been in the past.

THOMAS A. BROWNE,
Sec'y O. P. A.

LONDON.

NINETEENTH ANNUAL MEETING

The nineteenth annual meeting of the Poultry Association of Ontario was held in the Royal Hotel this afternoon at 1 o'clock, the President, Mr. John Eastwood, in the chair. Seventy-four members were present.

The President called the meeting to order, and then read the notice calling this meeting.

The minutes of the last annual meeting, and also of the Board meetings held since, were read, and, on motion of Mr. Oldreive and Mr. Trew, were received and adopted.

The Treasurer, Mr. Geo. G. McCormick, then read the financial report, which had been audited, showing a balance to the credit of the Association of $151.69. On motion of Mr. A. Bogue the report was adopted.

COMMUNICATIONS.

The following communications were then read, and dealt with as hereinunder written :—

From the Secretary Western Fair Board *re* appointing two representatives to that Association. Laid over until election of officers.

From N. Awrey, M.P.P., replying to our request *re* appointing Mr. A. Bogue representative to the World's Fair, Chicago, as superintendent of the Ontario poultry exhibit. Filed.

REPORTS OF COMMITTEES.

Mr. DILWORTH reported, as representative to the Toronto Industrial, that he had to the best of his ability looked after the poultry interests. The show in his department was somewhat crowded for room. A great deal had been spent in prizes and fixing up buildings, etc., but he was pleased to say that they had always been able to meet their expenditures.

Mr. BARBER coincided with the remarks of Mr. Dilworth.

Mr. GEORGE G. MCCORMICK reported, as representative to the Western Fair, London, that the show at London Fair would equal anything of the kind in America ; that the local Association had got out plans and called for tenders for remodelling the poultry building and submitted them to the Western Fair Board, who at once adopted them and proceeded with the work, and now they have the finest poultry building in Canada, and hoped the Industrial would follow suit.

Mr. J. H. SAUNDERS said a few things in reference to the success of the London Fair from the decorative standpoint. Last year he was Superintendent, and he had requested the committee to act along this line ; and they secured the services of the park ranger of the city, who decorated the building throughout with plants and flowers, adding largely to its attractiveness.

Mr. JOHN COLE stated that as the Central Fair had not been held, therefore there was no report.

Mr. ALLAN BOGUE reported briefly on the committee's interview with the Honorable the Minister of Agriculture in reference to the World's Fair exhibit. Mr. Dryden had promised to do everything in his power to assist them to make a creditable showing in the poultry department.

ADDRESS BY HON. JOHN DRYDEN.

The Hon JOHN DRYDEN here made his appearance, and was received by a hearty cheer from the Association. The President immediately requested Mr. Dryden to address the meeting, which he did in a very plain but forcible manner, setting forth briefly the objects his department had in view, and what returns they expected from this Association for the aid which they received from the department. He was pleased to see such a large and representative meeting, which proved beyond a doubt that we were a live and prosperous Association ; and, judging from the interest manifested, he had no doubt but one of the best portions of Canada's exhibit at the World's Fair in Chicago this year would be the poultry of Ontaro. He felt certain that it would command a large share of notice from the visitors who attend. This was a very important industry, one we could justly feel proud of, and one that could do as much to raise the standing of the country as any of the live stock industries. He did not think it necessary to remind those present that they should see that the stock they intend to exhibit should be up to the highest notch

of perfection so as to compete successfully with those from any other country. Everything that will assist them in regard to transportation and keep will be given by the department free to the exhibitor, and he hoped to see a large display. In regard to the annual work of the Association, he was glad to learn from the secretary that the institution had started on a new line of action, and one that would accomplish the work the department intended should be done by us. The position the Association should hold is one of an educator and instructor to the young breeders and the farmers generally—a place where they could get information of a practical kind. He referred to the preparing of essays upon the several branches of this industry upon such questions as, What kind of fowl should the farmer raise? How should we feed? How should we house them? How to doctor them? Invite discussion upon the essays, and in this way you will impart to one another suggestions that will result in much good. Also give the results of experience and experiments.

READING OF ESSAYS.

Mr. THOMAS A. DUFF read an essay on feeding and housing, which was well prepared, and listened to with interest.

Mr. C. J. DANIELS read an essay on the Derbyshire Red Cap fowl, and Mr. C. F. WAGNER one on pigeons.

Hon. Mr. DRYDEN requested that the gentlemen leave the papers with the Secretary for publication in the annual report published by the Government.

Moved by Mr. ROACH and Mr. MITCHELL, that a vote of thanks be tendered to the Hon. Minister of Agriculture for his presence and interesting discourse. Carried.

Mr. Wm. MCNEIL moved a resolution thanking the gentlemen who had prepared the essays, which was carried.

Mr. GEORGE G. MCCORMICK gave a short address on how to keep eggs and the proper breeding for farm use.

NEXT PLACE OF MEETING.

The place for the exhibition of 1894 was the next order of business.

After three votes were taken the choice fell upon New Hamburg, which choice was made unanimous upon motion of Mr. MCNEIL, seconded by Mr. MITCHELL.

FINANCIAL STATEMENT.

John J. Mason, Treasurer, in account with the Poultry Association of Ontario, for the year 1892.

Receipts.	$ c.	Disbursements.	$ c.
Members' fees	131 00	Balance due Treasurer	11 28
Donations	119 50	Prizes	1068 50
Legislative grant	900 00	Officers' salaries	168 18
Receipts from exhibitions etc	582 15	Directors' fees and expenses	23 00
Moneys borrowed	900 00	Postage and stationery	13 22
Advertisements in prize lists	49 50	Printing and advertising	164 65
Assets of 1891	2 00	Judges' expenses	136 00
		Paid for loans	642 60
		Fitting up exhibition building	27 16
		Building and repairing coops	89 08
		Feed and feed tins	31 15
		Superintendent, clerks and door-keeper	60 39
		Rent, fuel and light	70 00
		Old account with G. T. R.	27 25
		Balance on hand	151 69
	2684 15		2684 15

Examined and found correct.

H. B. Donovan,
Thomas A. Duff, } Auditors.

November 28, 1892.

ELECTION OF OFFICERS.

The following officers were elected, the President and 1st Vice-President going in by acclamation :

President: L. G. Pequegnat, New Hamburg.

1st Vice-President : Joseph Dilworth, Toronto.

2nd Vice-President : Wm. McNeil, London.

Moved by Mr. Bogue and Mr. McCormick, That the President, Messrs. Oldreive, Dilworth and the mover be a committee to select directors and report to the meeting for their approval. Carried.

While the Committee were out Mr. Wm. McNeil took the chair, and the Secretary then explained his action in regard to late entries being returned, and asked that this meeting decide the date for closing for the next show.

Moved by Mr. Bonnick, seconded by Mr. Cole, That the date of closing entries be one week before opening date of the show, and that all letters containing entries mailed that day be received—all later to be returned. Carried.

The committee on directors returned and reported as follows : We would recommend for board of directors the President and two Vice-Presidents ; Mr. C. Ernst, New Hamburg ; Mr. F. Goebel, New Hamburg ; Mr. G. S. Oldreive, Kingston ; Mr. D. C. Trew, Lindsay ; Mr. A. Bogue, London ; Mr. J. Buck, Brantford ; Mr. J. J. Mason, Bowmanville ; Mr. J. Coulson, Guelph ; Mr. P. H. Hamilton, Hamilton.

Moved by Mr. Kent and Mr. Saunders, That the report be received and adopted, and that the committee be discharged. Carried.

Mr. H. B. Donovan and Mr. Thos. A. Duff were elected auditors for another year.

Mr. George G. McCormick, of London, was elected Treasurer.

Messrs. Duff and Dilworth, Toronto, were chosen as representatives to the Industrial Exhibition.

Mr. Geo. G. McCormick and Mr. J. H. Saunders were appointed representatives to Western Fair, London.

Mr. P. H. Hamilton and Mr. John Cole were appointed representatives to Central Fair, Hamilton.

There being no further business, the meeting adjourned.

DIRECTORS' MEETING.

Hamilton, January 5th, 1893.

A meeting of the newly-elected directors of the Poultry Association of Ontario was held at the close of the annual meeting, Mr. L. G. Pequegnat in the chair.

Present: Messrs. McNeil, Goebel, Trew, Dilworth, Bogue, O. Ernst, Oldreive, and Treasurer Geo. G. McCormick.

Moved by Mr. McNeil, seconded by Mr. Oldreive, That the Secretary and Treasurer be empowered to discount a note in lieu of the Government grant not yet due, and pay the accounts as soon as possible. Carried.

Moved by Mr. Oldreive, seconded by Mr. Trew, That past President Eastwood settle the Hamilton accounts as cheaply as possible and certify to their correctness. Carried.

Moved by Mr. Bogue, seconded by Mr. Dilworth, That Mr. Buck be empowered to settle Mr. Graney's claim against this Association, and that the Treasurer give Mr. Buck a cheque for $40 for that purpose. Carried.

Moved by Mr. McNeil, seconded by Mr. Oldreive, That the Secretary's salary for this year be $100. Carried.

Mr. Oldreive gave notice of motion that he would at the next meeting move that the days for holding the Ontario poultry show be limited to three days.

The meeting then adjourned.

THE IMPORTANCE OF PROPER FEEDING AND PROPER HOUSING.

BY MR. THOS. A. DUFF, TORONTO.

When I was asked by our worthy secretary to contribute an essay at this meeting, I consented to do so, but it was, I must confess, with a great deal of diffidence, because I felt that it might seem like presumption upon my part to attempt to say anything that might possibly prove of service to the many old and long-established fanciers and breeders who would be here present. However, it occurred to me, notwithstanding that I have only been personally connected with the poultry industry for about three years, that I have perhaps been as successful a breeder and exhibitor as any fancier in the same space of time; and in view of this fact the thought struck me that perhaps it would not be amiss to let you know how I feed my stock and how I have them housed; and also to direct a few remarks relative to the precautions that should be taken for the winter. Of

course it must be understood that my experience has been gained only with a variety in the Mediterranean class, and one not as likely to take on fat as Asiatics or the larger breeds. You will, therefore, please bear in mind that I am not in a position, nor do I attempt to say how this system of feeding would work with the larger breeds; but, of course, my remarks relative to housing will, I think you will admit, apply to any and all varieties of fowl.

In the morning I give a warm meal composed of a mixture of cornmeal, bran, shorts and oat chop, in equal parts, fed as dry as possible, and I put with it about a tablespoonful of flax seed to each pen of seven birds. At noon they get a small grain, which is changed every week or ten days, the principal food being wheat, buckwheat and oats This is raked into about five inches of washed lake sand so that the birds have to scratch for it. At night the Black Minorcas get whole corn and the White Minorcas wheat or buckwheat. The reason for the distinction is my belief that corn gives all white birds a yellow or brassy plumage. A cabbage is hung up in each pen every week, and a plentiful supply of grit and fresh water is always before them. In addition they get daily a small quantity of lean meat, and also a supply of ground bone which I grind with a Mann bone cutter.

I keep seven birds in a pen 9x8, which gives over ten square feet to each bird. I do not allow the male to remain in the pen except during the actual breeding season. The house is kept sufficiently warm to prevent water from freezing.

Now, then, for a few remarks relative to the precautions which should be taken for the winter. The fancier who puts things in ship shape and has everything comfortable for his fowls on the approach of cold weather is sure to meet with success, and the one who neglects his stock will find himself behind competitors who have started with no better fowls nor better advantages. The idea that to begin with thoroughbred poultry, without giving them proper care, is an assurance of profit and satisfaction is erroneous. Neglected stock of all kinds will deteriorate much faster than it has improved. Improvement is of slow growth, and needs constant skill and attention, as well as good feed and proper care to keep it up to a certain scale of excellence, and afterward to improve such points as may need improvement to raise it to a higher standard.

The shiftless poultry breeder awaits frost, snow and blizzard before he attempts to fix up his hennery. He begrudingly gives an hour or two to a job which requires a whole day or two to put in ordinary condition. Work done in this way is usually only half done, for the breeder is in a hurry to get rid of his unpleasant task—the ground being frozen and everything covered with snow. A few mild days' thaw of the snow and the inside of the hennery becomes wet, and in this condition it will remain during winter—a fruitful source of rheumatism and other diseases.

Is it possible that such "slip-shod" poultrymen expect success under such conditions? If they do they are sadly bereft of common sense, bereft of human feelings, bereft of all the qualities essential to success and pleasure in raising poultry. The duty of caring for poultry in spring and summer is not so urgent and binding, because fowls having liberty and access to gardens, fields and orchards, can procure a large share of their living, and they can perch in an open shed without suffering from cold. If hens get their combs, wattles and toes frozen in the early part of winter, it puts them back in laying. In fact, severe exposure draws on nutrition to such an extent to keep up animal heat and to repair wastes that there is none for the formation of eggs. Every observant poultry keeper knows that a snow storm or intensely cold day will put back a laying hen for several days Science has demonstrated that egg production, as well as hatching, is governed by natural temperature, whether that heat is steady in the fowl or in the surrounding atmosphere. And when this fact is clear to every intelligent poultryman, it is strange that so many neglect fixing up their henneries in winter.

Common sense will show that frozen parts in fowls are dead, and, while attached to the live flesh, will keep up a constant stinging pain, and itching and tickling sensation, until they drop off or are restored to circulation. This is caused through efforts of the blood to circulate in the live flesh proximate to the frozen parts. It also takes time to

heal after the frozen parts separate. And a hen must be in the pink of condition to begin laying in mid-winter after such suffering. Eggs are not found in bleak hen houses, neither are fat and sleek looking fowls found in open quarters when snow, frost, sleet and winds find ready entrance.

After the task of fixing up and cleansing the hennery, a good plan is to separate the late hatched pullets from the hens, and give to each an assigned apartment, in order to afford the latter every facility for laying early, as the same attention to the former would not be productive of like results. A doz n hens in each place, means of exercise and dusting without being cramped up; grit, egg shell matter, charcoal, and other articles for the saving of feed and water, and keeping them clean and easy of access, are valuable aids to every flock in confinement. When you have done all this, do not make the fatal mistake of crowding too many fowls together, for as sure as you do all the work will be in vain, besides endangering the health of the fowls. The requisites of successful poultry keeping are within reach of every breeder; they are simple, reasonable and easily adjusted to the commonest of common sense. For—

Said Farmer Jones, in a whining tone,
To his good old neighbor Gray—
"I've worn my knees through to the bone,
But it ain't no use to pray.

"Your hens look twice as good as mine,
Though you don't pretend to be
A shining light in the church to shine,
And tell salvation's free.

"I've prayed the Lord a thousand times
For to make my darned hens lay;
And why your'n beats them so and climb,
Is more than I can say."

Said Farmer Gray to his neighbor Jones,
In his easy, quiet way—
"When praying gets mixed with lazy bones,
They don't make poultry pay.

"Your yards are dirty and houses all,
In spite of all your prayin',
You may pray for eggs till the heavens fall,
If you don't clean nests to lay in.

"I mix my prayers with a little toil,
And I clean out every house—
And I work with a will and good phenyle
To scare away every louse.

"And I've discovered, though still in sin,
As sure as you are born,
That hens will thrive and profit win
If fed on good sound corn.

"So while I'm praying for hens to lay,
I do my level best;
I get them green food once a day,
And the Lord he does the rest.

"It is well for to pray both night and morn,
As every farmer knows;
But the place to pray for eggs and corn
Is in the house and rows.

"You must use your hands when praying though,
If an answer you would get,
For prayer-worn knees and a lousy house
Ne'er filled egg basket yet."

DERBYSHIRE RED CAP.

BY C. J. DANIELS, TORONTO.

I have taken the Red Cap as my subject, as I feel more at home with this variety of fowl than any I have bred. It is six years since I made my first importation, and they are as great favorites with me to-day as then. I will first describe the breed and then its quality as a general utility breed.

THE MALE. The standard requirements are as follows: Weight, cock 7½ lb., cockerel 6 lb.

The distinguishing feature of the Red Cap, as suggested, is the rose comb which should be of good size, full of small spike, standing straight on the head, terminating at the nave in a well-developed straight spike, and bright red. The comb of the male bird is very much larger than that of the female.

The neck hackle of the cock should be rich dark red or golden red striped with bluish black, back black and red, breast and tail black, saddle rich deep red striped with bluish black, wings nut brown, legs slate color and of good length, earlobes and face red.

THE FEMALE. Weight, hen 6½ lb., pullet 5 lb.; the ground color of the female is a rich nut brown, each feather spangled with a bluish black spangle like a half moon; neck hackle laced with red, tail black and face red.

I have described their weight, plumage etc., and will now take their qua ities. I believe them to be the greatest egg producers of all the non-setting varieties, and in every sense of the word a general utility fowl.

I believe them to be ahead of all other varieties in production of eggs. I am not making any guess at this thing but would say that two years ago I took four pullets, April hatched—no particular pullets, but just four from the flock—and kept them in a pen with cockerel and kept a faithful record of eggs from these four birds, and the average was 200 eggs each bird. The eggs are very rich, not watery as some varieties.

It has been claimed that the Red Cap does not make a good table fowl. I claim they are ahead of the Leghorn in flesh and in weight, as a Red Cap will weigh from 2 to 2½ lb. more than a Leghorn. On Christmas day we had a White Plymouth Rock cockerel as our turkey; last Sunday we had a Red Cap cockerel. Without any comment on my part my wife asked what breed this was, as it was far better eating than the last one we had. As the old saying is, "the proof of the pudding is in the eating," I think the same will apply to the eating of poultry. I often have people say to me "What terrible combs, don't they get badly frozen in winter?" I have never had a comb of a Red Cap frozen yet. Again, the objection has been raised that they are not a good farmers' fowl, as hawks would bother them as the fowl would not be able to see on account of their large combs. This can easily be remedied by taking off the male's comb; I have done it and got just as vigorous stock.

In conclusion I wish to say that the Red Cap will not thrive on a damp heavy soil, but on a good, dry sandy soil they thrive splendidly. The females are very active and great foragers. I forgot to mention that the Red Cap is of English origin. I believe there are two distinct kinds—the Derbyshire and the Yorkshire. My experience has has been with the Derbyshire.

PIGEONS.

BY C. F. WAGNER, TORONTO.

It affords me much pleasure to have an opportunity of bringing pigeon culture to your notice.

Pigeons are, as a rule, looked upon by non-breeders at large as a mere play toy for boys; but I am pleased to say the perfection they have acquired is owing to the long-life study of many an old man. Yet they are not perfected.

First, we will consider them for market purposes only. Common pigeons usually found around the barn-yard are worth from 30 to 40 cents per pair. One pair will cost about 50 cents per year to keep. They will breed on an average eight pairs of young in one year. So if a man were to breed 50 pairs he would have at the end of the season about 400 pairs which would sell on an average of 35 cents per pair and would bring him a profit of $115 per year. They would require but little attention when let fly, as they forage for themselves.

If our farmers were to pay more attention to pigeon culture it would soon show itself as a very profitable business. Suppose they were to cross a Dragoon with a Runt they would have pigeons nearly the size of a chicken; their flesh would be much tenderer, there would be nearly as much meat on them, and they would command double the price of the present barn-yard pigeon.

Secondly, we will consider them as a hobby and for show purpose. Take the English Carrier; just look at him with his long thick neck, parallel skull, long thick beak, with plenty of wattle well developed, large circular eye wattles and fiery eyes. What a noble looking bird he is. He stands among fancy pigeons as the game cock does among the fowls. The English Carrier is considered the king of the pigeon tribe. He is not used as a messenger pigeon, but for show purposes only. Take the Pouter. What a fine looking bird he is, with his long stocking booted limbs, slender girth and large crop blown full of air. How proud he struts about the loft and makes himself known to all comers, for he loves to show his great blowing powers. These birds range from $5 up to $200 each, and even more sometimes. They eat about $\frac{1}{4}$ of a cent's worth of feed every day, which is a very small item, considering the price they bring.

It is cheaper and more profitable to pay a fair price for a pair of pigeons which will produce good stock than it is to buy birds at a low figure which will only breed young that bring small prices.

Take the Fantail in its perfection. How beautiful a bird it is with its broad, flat, circular tail and its nervous action. It totters about on tip-toes so proudly, as though it would like to flirt with everyone. It has many admirers. Good birds bring very high prices, some as high as $100 each. It pays to breed the best for they don't eat any more than the poorer ones.

Jacobines are also very pretty pigeons. They remind one of the ladies in the winter time with the high fur collers around their necks; but these favorite birds when good in quality have their heads completely burried in the long feathering of the head, which is called the hood. The mane is the feathering which forms a curved line at back of the neck from the back to the top of the head, which reminds one of the well-arched neck of a high bred horse. The chain is the feathering in front, which extends from top of the head down the breast, fitting closely in front, leaving no open space from the bottom up to the throat. Fancy pigeons draw great crowds, as a rule, to the shows and are much admired by everyone.

Thirdly and lastly, we will consider the Homing pigeons. They are becoming very valuable as messengers along our frontier, and not only that, but for household purposes, too. They are a distinct breed from the English Carrier. When a man leaves home and wishes to send a message to his wife he can take a pigeon along with him and attach the note to its tail feathers and let it fly. It is customery to roll the note up and slide it into a goose quill and then tie both ends firmly underneath one of the tail feathers where it remains until the bird arrives home. Homing pigeons have been flown in American distances of 1,000 and 1,200 miles at one stretch. Two years ago there were two messages sent from the Mayor of Guelph to Lord and Lady Lansdowne, at Toronto Industrial Exhibition. After the birds had done their duty, they were named by their Excellencies—one Gordon and the other Ishbelle. These birds happened to be owned by your humble servant.

ANNUAL REPORT

OF THE

EASTERN ONTARIO POULTRY AND PET STOCK ASSOCIATION.

To the Honorable the Minister of Agriculture :

SIR,—I have the honor of forwarding to you the report of the Eastern Ontario Poultry and Pet Stock Association for the year 1892, and also of our Annual Exhibition, which was held in January, 1893. There were held during the year meetings on the first Monday of each month, with the exception of July and August, all of which were well attended. At these meetings, after the general routine business, discussions usually took place on general topics relating to poultry culture, the members giving their experience as to feeding young and old chickens, artificial incubation, number of chickens hatched, number of eggs laid, etc. Great interest was taken in these discussions, and much information gained by the members. The Annual Exhibition was held from January 31st to February 3rd, in the By Ward Market Hall, Ottawa. As stated in my last report, the hall itself is well suited for a poultry show, but being some distance from the principal part of the city, it was not well attended, which accounts for the small amount of door receipts. It was the intention of the Association to have held a bench show of dogs in connection with the poultry show, if the use of the drill hall could have been obtained for the purpose, as it was thought the two combined would draw a large attendance, but, unfortunately, the drill hall could not be obtained. The entries were much larger than last year, especially in the pigeon department, which was accounted for by the fact that the Association gave prizes for single birds instead of the old style of pairs, and also provided coops, which in former years had to be supplied by exhibitors themselves. These coops were only cheap temporary ones, made of rough lumber, with wire fronts and lath backs, but served the purpose very well. Next year, however, the Association expects to have wire coops for pigeons, and have instructed the Secretary to procure samples from England. The entries in fowls were also larger than last year. The exhibits of Games, Golden, Silver and White Wyandottes, Barred and White Plymouth Rocks and all varieties of Bantams were especially large and fine, while the Leghorns and all varieties of Cochins were unusually small ; other varieties were about the same as last year. The judges were I. K Felch, of Natick, Mass., for fowls, and James Lumsden, of Montreal, for pigeons, both of whom gave satisfaction. The judging of fowls was done by the use of the score card, and all birds not disqualified were scored ; there is quite a little dissatisfaction in this way of judging, and many exhibitors prefer the old method of judging by comparison. It is a great pleasure to be able to state that the exhibitors in general were well satisfied with the show, and those from a distance expressed themselves as such, and especially at receiving their prize money before leaving for home. Our Association pays prize money in full before the close of the show, and we see no reason why this should not be done by all associations.

During the Exhibition an informal meeting was held in the office of the Secretary, at which several matters of interest were discussed, one being the advisability of holding meetings in the evenings during the Exhibition, at which each breeder should explain his method of treating fowls and the remedies applied to cure them of their various vices ; also system adopted in raising birds for marketable and domestic purposes. A

discussion also took place as to the relative merits of raising chicks by artificial means, and as to the percentage of birds hatched and raised in that way as compared with the natural way—the hen. A discussion also took place as to the advisability of having the poultry at the Experimental Farm exhibited in order that their standing as compared with other exhibits might be determined. A list of members and officers, and also the financial statement was sent to your Department a short time ago.

I have the honor to be, Sir,
Your obedient servant,
ALFRED GEDDES,
Secretary.

OTTAWA.

FINANCIAL STATEMENT.

P. G. Keyes, Treasurer, in account with the Eastern Ontario Poultry and Pet Stock Association, for the year ending September 30, 1892.

Receipts.	$ c.	Disbursements.	$ c.
Balance on hand	15 77	Prizes	306 50
Members' fees	57 00	Officers' salaries	55 00
Donations	30 00	Postage and stationery	8 80
Legislative grant	400 00	Printing and advertising	59 00
Receipts from Exhibition	34 70	Judges' expenses	43 00
Entrance fees	124 25	New coops	65 00
Advertisements	3 00	Cleaning of hall and storage	22 00
Birds sold	12 00	Fuel and light	11 25
Refund	3 00	Sundry accounts	53 41
		Balance on hand	49 76
	679 72		679 72

Examined and found correct.

E. H. BENJAMIN, } Auditors.
O. A. ROCQUE, }

October 6, 1892.

LIST OF OFFICERS.

President, Alex. Stewart, Hintonburg; *Vice-President*, G. S. Oldreive, Kingston, and F. Auclair, Ottawa; *Secretary*, Alfred Geddes, Ottawa; *Treasurer*, P. G. Keyes, Ottawa.

Directors: E. H. Benjamin, Wm. Cooch, C. J. Devlin, E. Edwards, George Higman, John Mason, Thomas Mason, E. Turcotte, of Ottawa, and G. C. Howison, Brockville.

Auditors: O. A. Rocque, Orleans, and E. H. Benjamin, Ottawa.

ANNUAL REPORT

OF THE

BEE-KEEPERS' ASSOCIATION

FOR THE

PROVINCE OF ONTARIO

1892

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY.

TORONTO:
PRINTED BY WARWICK & SONS, 68 AND 70 FRONT STREET WEST,
1893.

ANNUAL REPORT

OF THE

ONTARIO BEE-KEEPERS' ASSOCIATION.

To the Honorable the Minister of Agriculture :

SIR,—I have the honor to submit for your approval the Annual Report of the Ontario Bee-keepers' Association for 1892. A report of the proceedings of the annual meeting held at Walkerton, together with the audited statement of receipts and expenditures, is submitted herewith.

The President's address, the papers read and the discussions thereon, included in the report, will, it is hoped, be found of interest and profit to those engaged in bee-keeping.

I have pleasure in reporting an increase of over fifty in the membership, and an increase of two in the number of affiliated societies, there being now ten instead of eight —the number in 1891.

I have the honor to be, Sir,

Your obedient servant,

S. CORNEIL,
Secretary.

OFFICERS FOR 1893.

President.....F. A. GEMMELL.....Stratford.
Vice-President.....ABNER PICKET.....Nassagaweya.
Secretary.....S. CORNEIL.....Lindsay.
Treasurer.....MARTIN EMIGH.....Holbrook.

Directors:

Division No. 1.—W. BROWN, Chard.
" 2.—J. K. DARLING, Almonte.
" 3.—M. B. HOLMES, Athens.
" 4.—A. PRINGLE, Selby.
" 5.—S. CORNEIL, Lindsay.
" 6.—W. COUSE, Streetsville.
" 7.—D. CHALMERS, Poole.
" 8.—F. A. ROSE, Balmoral.
" 9.—J. B. HALL, Woodstock,
" 10.—R. MCKNIGHT, Owen Sound.
" 11.—JOHN MYERS, Stratford.
" 12.—E. A. JONES, Kertch.
" 13.—R. H. SMITH, Bracebridge.

Auditors:

R. F. WHITESIDE.....Little Britain.
THOMAS J. WEBSTER.....Oakwood.

Foul Brood Inspectors.

WM. MCEVOY, Inspector.....Woodburn.
S. BRAY, Sub-Inspector.....Alliston.

ANNUAL MEETING

OF THE

ONTARIO BEE-KEEPERS' ASSOCIATION.

ANNUAL MEETING.

The thirteenth annual meeting of the Ontario Bee-keepers' Association was held in the chamber of the County Council, Walkerton, on Tuesday, Wednesday and Thursday, 10th, 11th and 12th of January, 1893. A large attendance of members was present, among whom were: F. A. Gemmell, Stratford, president; W. Couse, Streetsville, secretary; R. McKnight, Owen Sound; G. T. Somers, editor *Canadian Bee Journal*, Beeton; Martin Emigh, Holbrook; S. Corneil, Lindsay; J. B. Hall, Woodstock: W. McEvoy, Woodburn; J. B. Aches, Poplar Hill; S. T. Pettit, Belmont: Dr. Duncan, Embro; D. Chalmers, Poole; John Myers, Stratford: W. J. Brown, Chard; F. A. Roe, Belmore; J. K. Darling, Almonte; E. A. Jones, Kertch; J. Alpaugh, St. Thomas; A. Picket, Nassagaweya; W. A. Chrysler, Chatham; C. Edmonson, Brantford; Aaron Shantz, Haysville, and A. E. Sherrington, Archie Tolton, F. X. Ernst, Abraham Rowand, John Harkley and Andrew Rowand, all of Walkerton.

President GEMMELL having taken the chair, the reading of the minutes of the last meeting was proceeded with, after which Mayor Klein was introduced, and expressed his pleasure in welcoming to Walkerton the Ontario Bee-keepers' Association.

A vote of thanks to his worship the Mayor having been passed, it was moved by J. B. HALL, seconded by S. T. PETTIT, that each person sending extracted honey to Chicago be requested to send a part of it granulated and in glass. Carried.

Moved by S. T. PETTIT, seconded by M. B. HOLMES, "That the term linden, instead of basswood, be used for naming honey when exhibited at Chicago."

The meeting then adjourned till 7.30 p.m.

QUESTION BOX.

The following questions were read by the Secretary:

WHY BEES STING ABOUT THE EYE.

Q. Why do bees so frequently sting about the eye when annoyed?

The reason given was that the quick movements of the eye attracted them.

Extracting Honey and Swarming.

Q. How can an apiary run for extracted honey be managed so as to prevent swarming?

Mr. Aches would shade and give plenty of room.

Mr. Corneil: Extract the honey clean every day.

Mr. Hutchinson: The matter may be summed up thus: Plenty of room for storing honey and plenty of room for the queen to lay will prevent it.

Mr. Darling: In regard to second swarms, I find that even when the queen cells are all destroyed the bees will sometimes swarm.

Shading Hives in Summer.

Q. What is the best method of shading hives in summer?

Mr. Aches: I consider that fruit trees are quite a good shade.

Mr. Corneil: I have had my bees shaded by fruit trees for some years, but latterly I have been moving the hives to places where they will get more sunshine. I find that bees under dense shade do not build up in spring as rapidly as those in the sunshine. Besides it is a nuisance to be striking one's head against the limbs, or tearing one's veil. No more bees under fruit trees for me.

Mr. Aches: Weak colonies in the shade will not build up as quickly.

Mr. E. A. Jones: Colonies left exposed to the sun give the best result.

Mr. McKnight: The castor-oil plant makes a good temporary shade—much better than the sunflower.

Dr. Duncan: A board placed over the line so that there will be an open space between the two makes a good shade.

Mr. Chalmers: I raise the board covers of my hives so that the air can circulate freely.

Mr. Picket: I would shade moderately, except where colonies are weak; such colonies are better exposed to the sun.

Mr. S. T. Pettit: I find that the shade of fruit trees retards swarming.

Proper Temperature for Hives.

Q. What is the proper temperature to have hives in?

Mr. Corneil: When brood-rearing is going on vigorously the temperature inside the hive is about 95°.

Mr. J. K. Darling: I find the hives keep much cooler when the ground is covered with grass and the hives are raised a few inches above the ground.

The Height of Hives Above Ground.

Q. What is the proper height to have hives raised from the ground?

Mr. John Myers: Six inches is about the proper height. I have an apiary without any trees. I use boards for shade.

Building Worker Comb Only.

Q. How can we get our bees to build worker comb only?

Mr. W. Z. Hutchinson: If a colony is headed by a young queen a large proportion of the comb built will have worker cells. Second and third swarms build worker comb only.

Mr. SHERRINGTON: I have succeeded in getting worker comb only by using full sheets of foundation.

Mr. J. B. HALL: It can be got by giving room above for storing and starters for brood combs below.

Mr. S. T. PETTIT: I have had more pollen in the sections when using starters in the brood frames than when using full sheets of foundation.

Mr. S. CORNEIL: When following the plan of hiving swarms in a few frames with starters, as advocated by Mr. Hutchinson some years ago, I got pollen in the sections and a very large percentage of drone comb below; besides the swarms would not stay in the hives. I would recommend nearly full sheets of foundation.

Mr. J. B. HALL: When I hive swarms and starters in the brood frames I wait three days before putting on the sections in order to prevent the bees from storing pollen in them.

Mr. W. Z HUTCHINSON: By using starters only in the brood frames there will likely be trouble with the bees swarming out.

FIRST DAY—EVENING SESSION.

The Association resumed business at eight o'clock, when the President, Mr. F. A. GEMMELL, read the following address:

THE PRESIDENT'S ADDRESS.

The President's address, as a matter of course, is a thing that is looked for at all, or nearly all, organized association meetings. True, their general make-up differs widely, in many instances does not embrace all that properly belongs to such an address; and this being my initial one, will doubtless be found no exception to the above. Therefore I trust any apparent inconsistencies or flagrant omissions will be received with due consideration. While regretting the small representation of ladies present, I am, nevertheless, gratified at the large number of apiarists here assembled. This, however, was what I expected, as I know from past experience that Bruce and its adjoining counties contain many enthusiastic and enterprising bee-keepers. Having resided within a few miles of Walkerton, its county town, for about ten years, I know whereof I speak.

It has, nevertheless, occurred to me that the suggestion made by myself some little time since, to the effect that advertising in the local papers, as well as in *The Canadian Bee Journal*, has helped in a measure to bring out some who had no other means of knowing the date of such meeting. In fact, it appears to me, our past gatherings have lacked numbers, and consequently suffered from want of enthusiasm on this very account.

Having said this much by way of introduction, I will pass on to some of the more important matters my address is supposed to touch upon in connection with the pursuit. Therefore I may state that it is quite a bonanza to myself as also to a large majority of bee-keepers, especially in the western portion of the province, that, notwithstanding our grave fears of another poor season, on account of the late backward spring, our hopes have been more than realized in having a crop above the average; and indeed in some of the more favored localities, we have had about the best season ever remembered, thereby to some extent reassuring those who have of late been concluding that successful apiculture was going to become—what we soon hope to see the McKinley bill—a thing of the past.

I must confess, however, that in numerous instances difficulties have presented themselves, and it did really seem to me that the honey producer of the future was not only to a great lover of his calling, but, in addition, one who must be possessed of considerable resolution and perseverance to continue it, as no sooner has one obstacle been disposed of

than others have presented themselves. Hence, after securing the much-needed legislation in regard to foul brood, the spraying of fruit trees, etc., we now stand face to face with others. Yes, plain sailing, it appears, does not yet seem to be our good fortune, and our united efforts must still continue the good work of suggesting the best means with which to deal with poor prices, the expected honey misrepresentation, and lastly, the most serious of all, the comb sugar-honey fraud.

Now, gentlemen, it is not my intention to enlarge upon these topics here. These I shall leave for other and wiser heads to wrestle with ; suffice it to say, for the present, that in regard to the first, I think many of the bee-keepers are in a great measure to blame for the present state of affairs, the result principally of too great anxiety to dispose of the crop in the early part of the season, under the impression that it would be a drug on the market. An instance has been brought under my notice in which a producer disposed of several thousand pounds of A1 extracted honey at about five and a half cents per pound, and a quantity of the dark article at a trifle over one and a half cents per pound. As to the remedy in such cases, it is rather difficult to suggest one ; at the same time, I think the suggestion made by Mr. Holtermann that honey should by some means be quoted regularly in the market reports the same as butter, eggs and other products, and thus be brought constantly and more prominently before the public.

The adulterated extracted honey misrepresentation, which rather unfortunately has crept into one of our most widely circulated family newspapers, through the rather indiscreet article furnished by my friend, Rev. W. F. Clarke, over the *non de plume* of Lindenbank, is one that seemed of such a serious character that I cannot pass it unnoticed, believing as I do that little of any such is sold in Canada, and this certainly not by producers, the low price of the article not favoring such a practice. The last grievance already mentioned, viz. : the sugar comb honey fraud, had its origin in the neighboring republic of Uncle Sam, and first saw the light of day in *The Review*, published at Flint, Mich., by my friend, W. Z. Hutchinson ; but as this gentleman is present with us I shall not attempt any explanation in regard to it, knowing all will be pleased to more fully learn his views and assist in devising a remedy. As I understand, no one is more anxious than himself to see it corrected, I will, under the circumstances, only add that I regret its appearance at present, in the hope that a return of good crops would have silenced forever such a proposition or suggestion, and further, that many of the local or county associations have deemed all the matters referred to of such vital importance to the welfare of our fast-growing industry as to pass resolutions and appoint delegates to bring them prominently before this Association with a view of securing such stringent legislation as may be thought beneficial and advisable in order to prohibit the production, manufacture, importation or sale of any or all of them. Among the local associations I might mention Oxford County, which I believe took the first step, as it generally does in such matters, followed by Perth, Listowel and Middlesex. There were no doubt others ; but I mention these particularly on account of having attended all of them. Whatever action therefore is taken, if any, it seems to me that it would appear with much better grace coming from the bee-keepers themselves at a time when such reports are in their infancy, instead of waiting until the public look so distrustfully on us that we, as a last resort and possibly when too late, commence doing what should have been done before.

As this paper is now considerably longer than I at first anticipated it would be, I will, in as brief a manner as possible, touch on a few other subjects. As, however, I am not certain that the manner of affiliation with the North American Association will be discussed at this meeting, I am prompted in the event of its being so to say that I hope, after all has been said and done, we will, as Canadian bee-keepers, as far as possible, dispense with any personal feelings and continue our fraternal good-will towards our American brothers, to many of whom we owe much of our knowledge of apiculture. As I know from correspondence with some of the officers that the desire is prevalent in so far as they are concerned that any barrier at present existing between us may be removed, I trust this condition may soon be brought about.

As to the very important matter of sending our honey to Chicago, it would be almost out of place on my part to say anything thereon, as most of you, if not all, are already aware that Mr. Allen Pringle, late president of this Association, has been appointed to

that charge and will give you all the necessary information. No one, I am sure, could be more fitted for the position, consequently I will say nothing more concerning him or his work.

I suppose it would, on the other hand, look a little singular were I not, before concluding, to refer to what has been done respecting foul brood, as most of you are doubtless aware of the great interest I have always taken in regard to it from its first agitation until the present time. I may, therefore, here mention that at the request of Mr. Holtermann, who is the secretary of the Ontario Agricultural and Experimental Union, I, in company with Mr. William McEvoy, our official foul brood Inspector, and Mr. Abner Picket, the Vice-president of this Association, attended a meeting at Guelph Agricultural College on the 22nd December last in order to hear a paper by Mr. J. J. Mackenzie, of Toronto, on this plague from a scientific standpoint, and am therefore pleased to be able to inform you that while the professor and Mr. McEvoy may not agree as to its origin, still so little difference exists regarding it otherwise that I conclude I am quite safe in saying that our Inspector is to all intents and purposes sufficiently scientific to treat the disease in a practical and successful manner, and more effectively than anyone else has yet done. I learn also that Mr. Mackenzie intends during the coming season of 1893, to still further carry on other experiments of importance to the pursuit, and these will also be given the public in due course. I need add nothing more than to say that, unlike my worthy predecessor, Mr. Pringle, who was not only amazed at the extent of the disease, I, on the other hand, was prepared for all, yea, even more, than it has been the duty of the Inspector to reveal; and in this, I regret to say, I have not been disappointed. I therefore need only further assure you that Mr. McEvoy has done efficient work during the past season, and I trust our hopes may soon be realized in that little, if any, of the scourge may be found a menace to the pursuit, which, when compared with all the other evils, surpasses them all.

While thanking those who were kind enough to place me in the position I now occupy, I may say that I have endeavored to honestly carry out the duties entrusted to me, and especially in regard to faithfully instructing the Inspector when and where to proceed on his duties, a thing by the way I think my predecessor knows is not so easily and satisfactorily done in all cases. Finally, should this paper prove of value in assisting those present in overcoming some of the difficulties referred to, I shall feel amply repaid for the attention you have given me, and will only add that I trust you may all have a prosperous season during the coming summer of 1893.

Moved by Mr. E. A. Jones, seconded by Mr. S. T. Pettit, that the thanks of this Association be tendered the President for his address. Carried.

HOW I PREPARE BEES FOR WINTER AND CARE FOR THEM IN SPRING.

Mr. Wm. McEvoy read the following paper:

With me, the main and most important part of the work is done in the honey season. I keep every colony very strong in bees, and some days before the honey season closes I stop taking honey, so as to have the combs in the top storeys sealed over nicely for winter stores. Then, about the first of October, I remove the top storeys with their sealed combs to a room arranged for the purpose. I then remove the combs out of every brood chamber and then bring out the sealed combs that I took out of the top storeys and place six of them in each brood chamber, with division boards on each side of them. Then, about the middle of October I pack each colony in a winter case on the summer stand, with four inches of leaves on each side and six inches on top. Before packing I put in a bridge which has an entrance in it three-eighths scant by three inches, and I never let the entrance get blocked up with snow in winter. When packing I always take the covers off the brood chambers and put the leaves on the cloth that covers the frames, and then place the lid or cover of the hive on top of the leaves. By having the leaves

between the bees and hive lids the heat will be kept in, all dampness will escape and then the brood chambers will be kept dry at all times. In warm evenings in spring I take out the division boards and give each colony its full set of combs. The combs that I put in in spring will have more or less honey in them. I then let every colony alone until the fruit bloom is over, unless the weather has been unfavorable during fruit bloom. Between fruit bloom and clover I see that there is plenty of unsealed honey in the combs; if not, I feed in the evenings until there is, because the larvæ is never as well fed when all the unsealed stores are used up. In favorable weather the bees will gather abundance from fruit bloom and dandelions to feed the brood well and keep a large quantity of unsealed honey on hand. Then, right in the middle of it all, we sometimes get a frost followed by rainy weather, which cuts off the honey flow so suddenly that the bees have to use up the unsealed stores at once to feed the larvæ. Then, when the unsealed is used up and no honey coming in, and with a large quantity of larvæ to feed, the bees will not at such times uncap the sealed stores fast enough to keep pace with the large amount of larvæ that needs feeding. Then, if the weather keeps backward after that, so that the bees get little or no honey, they will begin to drag out some of the larvæ; and a little later on we will find dead brood (starved brood). The larvæ that is lost at such times is the very life blood of the honey business. I always save over plenty of honey in the combs for spring, and then, between fruit bloom and clover, if the season is unfavorable, I go to work in the evenings and fairly boom the colonies. I do not disturb or feed any colonies in early spring. About the first of June I unpack my bees and store the leaves away in a building until fall. After the packing is taken out I raise the winter case up half an inch in front and then keep these winter cases on all summer to shade the colonies from the great heat that we sometimes get from the sun in summer. I have wintered all my bees in these cases since 1875, with the exception of some colonies that I put in a good cellar to test which was the best place to winter. I prize the winter cases very much, as they are very valuable for guarding the bees against the winter frosts and summer sun. With strong colonies crowded on six combs of early, well ripened, sealed stores of the best quality, and well packed with leaves on the summer stands, I can bring all colonies into spring booming in bees, unless some one gets queenless.

Mr. S. Corneil: Do you put the covers of the hives directly on the leaves without any space between?

Mr. McEvoy: I do and I find no bad results. I prefer leaves to any other material.

Mr. John Myers: How do you prevent the leaves from dropping down into the hives when you use so few frames?

Mr. McEvoy: The two division boards so nearly fill up the space, that there is no trouble from the leaves dropping down.

Mr. S. Corneil described an experiment which he made some years ago, the result of which showed that the heat from the bees will pass off through a solid board much more rapidly than through a quilt of wool.

Mr. J. Myers asked Mr. Corneil if painting the board would prevent the heat from escaping.

Mr. Corneil answered that it would not. He said that of course if warm packing, such as wool or leaves, were placed over the board the heat would be retained. The question then became one of upward or lower ventilation, and bees can be wintered well with either one.

Mr. J. Alpaugh: I put the lids close down on the leaves when using them, to prevent draft from occurring.

Mr. R. McKnight: I leave my bees in ten combs for winter, and when packing find properly dried sawdust preferable to leaves.

Mr. J. Myers: I wish to ask Mr. McEvoy how long it takes the bees to make room for breeding by consuming the stores out of combs entirely filled and sealed?

Mr. McEvoy: There would be room about the middle of January when on six combs.

Dr. DUNCAN: The material which is the best non-conductor of heat makes the best packing for winter.

Several members recommended cork dust for packing.

Mr. W. McEVOY: I prefer clover honey for winter stores.

Mr. S. CORNEIL: If our total crop only averages from 50 to 75 lb., 30 lb. for each colony out of our very choicest honey for market, makes a big hole in what we have to sell at the highest price. In the fall previous to the terrible winter of 1881-2, I helped a neighbor to purchase and bring home eleven hives which had stored a considerable quantity of buckwheat honey. He packed them with oat hulls in a clamp outside, and everyone came through in good condition. Clover honey is good for winter stores, but I am not afraid of buckwheat honey, and at present it is not good for much else. In finishing up my winter preparations last fall, I put straw under about half of my outside cases to retain the heat and neglected to do the same with the remainder, which I now regret.

Mr. S. T. PETTIT: I think packing under the hives little benefit.

Mr. J. ALPAUGH: I use packing under the hives and approve of it.

Mr. S. CORNEIL: I have my frames raised two inches above the bottom board to give my bees a breathing space. In my early bee-keeping days, I purchased $100 worth of bees in the fall in box hives. The bee-keeper from whom I purchased told me he always wintered safely by placing his hives in the cellar, and raising them up an inch or so by placing blocks under the corners. He also left one of the holes in the top open. I had read a short time before a paper by Prof. Cook on "Insect Respiration." In this paper the professor said that bees in winter hybernated so that they were just on the "dead line," and required no ventilation. After reading this article I thought I knew more about the ventilation for bees than the box hive bee-keeper. The box hives had only a very small triangular fly hole for ventilation and I gave them no more. In spring eight were dead, and the remaining two died before June. I had other hives in the same cellar, with better ventilation, and they came through well. The bee-keeper from whom I purchased had thirty-two left, and he did not lose a single one. My bees died from the effects of their own breath.

QUESTION DRAWER.

The following questions were asked:

CLEARING SNOW FROM ENTRANCES TO HIVES.

Q Should the entrance of the hives be kept clear of snow in winter to allow free ventilation?

Mr. W. McEVOY: I would keep them clear.

Mr. R. McKNIGHT: I would clear away the snow if there was a crust on it. If there was no crust I would not be alarmed about the bees not getting plenty of air.

Mr. J. E. FRITH: I would winter indoors as I consider it generally better.

Mr. R. McKNIGHT preferred wintering indoors, as there is a great saving in stores by so doing.

Mr. W. Z. HUTCHINSON: I prefer wintering indoors in a cold locality, but if I were in a fairly warm locality I would prefer wintering outside.

Mr. MARTIN EMIGH: I prefer cellar wintering.

Mr. S. T. PETTIT: I do not approve of upward ventilation in hives in winter. I have my covers sealed down closely.

Air Passing Through Frozen Earth.

Q. If bees were wintered in clamps covered with earth and the earth became frozen, would air pass through the frozen earth?

Mr. Corneil answered that in the northern portions of this continent the inhabitants lived in what are called "igloos," built by setting up large blocks of ice, and closing the joints up by pouring water over the ice until the house is perfectly close. But it is found that when there is a strong wind the flame of the oil lamp is visibly affected by the air which is driven through the solid wall of ice. There is no doubt whatever that air will pass through frozen ground.

DIRECTORS' REPORT.

To the Members of the Ontario Bee-keeper's Association:

Your directors beg leave to submit the following report:

During the year there have been two meetings of the board, the first one immediately after the last annual meeting at London, and the latter at Walkerton to-day, the 10th January. At the former the different officers and delegates were appointed. The matter of premium to members was discussed, and it was decided that the *Canadian Bee Journal* should be given to the members of the Association, unless they desired the book "The Honey Bee."

The matter of grants to affiliated societies was discussed, when it was decided to appropriate two hundred dollars to the affiliated societies, but that no one society was to receive over twenty dollars.

Mr. Allen Pringle was appointed a delegate to the Central Farmers' Institute.

Mr. J. B Aches and J. B. Hall delegates to the Western Fair Association at London.

Mr. Gemmell and Mr. McKnight delegates to the Toronto Industrial Exhibition Association.

Messrs. Pringle, Gemmell and E. D. Smith were appointed a committee to meet the Minister of Agriculture in regard to getting legislation to prevent the spraying of fruit trees in bloom to the detriment of bees, which is at a time or season that is of no benefit to the fruit.

Messrs. McKnight, Corneil and J. B. Hall a committee to consult the Minister of Agriculture at Toronto in regard to the management of the grant or expenses of the foul bood Inspectors and to apply for a similar grant as last year.

Mr. Pringle and the secretary were appointed a printing committee.

At a meeting to-day the board discussed all bills due and passed them to be paid.

It was moved by S. Corneil and seconded by J. B. Aches, "That in the opinion of this board it is desirable that the report of the foul brood inspector to this Association should include in detail the names of and location of the owners of apiaries visited and their condition."

A resolution was passed that the President instruct the foul brood inspector to disinfect his person as required by statue after inspecting foul brood apiaries.

We are pleased to report a considerable increase in the membership, there being two hundred and thirty-one members.

There has also been an increase in the affiliated societies over last year, there now being ten with a total membership of about 200.

The affiliated societies have not reported as fully as desirable, and the board must insist upon full reports from all such societies.

W. COUSE,
Secretary.

Walkerton, Jan. 10. 1893.

AUDITORS' REPORT.

Financial statement of the Ontario Bee-keepers' Association for the year ending January 10, 1893:

RECEIPTS.

Cash on hand from previous year	$29 86
Members' fees	231 00
Legislative grant	500 00
Affiliated Societies' fees	50 00
	$810 86

EXPENDITURE.

Grants to Affiliated Societies	$200 00
" Industrial Fair and Western Fair	35 00
Officers' salaries	75 00
Directors' fees and expenses	239 63
Periodicals for members and printing	125 00
Miscellaneous	29 96
Representative delegates' expenses	54 25
Services from late treasurer for six years	50 00
	$808 84
Balance	$2 02

Examined and found correct this 10th day of January, 1893.

J. B. RITCHIE, } Auditors.
ARCH. TOLTON, }

SECOND DAY—MORNING SESSION.

The meeting was called to order by the President.

The Secretary read the reports of the affiliated societies.

After some discussion, it was moved by JAS. E. FRITH, and seconded by J. B. HALL, that the Secretary be requested to prepare a new blank form for the financial statement, adding two columns to the form at present in use. Carried.

WHY IS IT?

Mr. J. K. DARLING read the following paper:

Mr President, ladies and gentlemen,—When requested by the Secretary to prepare a paper for this meeting I did not know what to say in reply. My experience is not sufficient to warrant me in choosing a subject relating to apiculture and treating it as it ought to be treated. I thought I could not do better than note a few of the difficulties that I have met from time to time, some of which I have partly well overcome, while others remain as obstinate as ever. The object of this paper is not to show what little I know about bee-keeping, but rather to string together a few of the difficulties that are more or less annoying to the majority of bee-keepers, especially those who have not had experience enough to help themselves over these sand bars in the stream they have decided to float upon. I say "help themselves," for it is when a man is not able to help himself and has to depend upon the information he gets from the books and periodicals devoted to apiculture that his real troubles begin.

Why is it that the instruction given in this manner so often proves partially if not wholly useless to the novice who is trying to carve his way as a bee-keeper?

Why is it that men like E. R. France aver that they can reduce swarming to a minimum and obtain large crops of honey by caging or removing the queen for a time during the honey flow? Whilst, if this plan was tried on by a novice, nine times out of ten he would have not only no swarms, but also a lot of sulky bees that would do nothing for him or themselves either, and would ball their queen when returned or when let loose if she had been caged on top of the frames.

Why is it that others, like G. M. Doolittle (a very great misnomer, I think), declare that there is no way that they can get as good crops as by natural swarming? Yet, if a novice tries to follow this plan, he would be likely to have more swarms than honey.

Why is it that the majority of writers advise keeping the queens doing their level best?—Professor Cook going so far as to advise having laying queens ready to put in a hive after it has swarmed, so that no time be lost; while the experience of a great number of bee-keepers shows that a larger quantity of honey is stored when there is no brood to feed for ten to fifteen days than there is when the colony is kept raising bees that may be good for nothing except to consume the stores that have been laid up for winter use.

Why is it that some of those very prolific queens sometimes prove to be the poorest stock a man has in his yard?

I remember one such case in my own yard some years since. There was one colony—a prime swarm—that pleased me very much; *always at it*, and when I would lift the sheet off the frames everything appeared lovely. In a short time I began extracting, and took a lot of honey from other colonies, but when I came to my favorite, what did I find? Twelve "Jones" frames solid with brood, with a little honey along the top bar: not ten pounds of honey in the hive. Everything was converted into brood, and that in July, when it was not wanted in anything like that quantity.

Why is it that some writers will tell you to "crowd" the bees below in order to drive them into the sections (is this not the advice generally given to the inexperienced)? And yet, if the "crowding" is done by some other than the writers, they swarm (that is, the bees swarm and not the writers) and the game is up; while, at the same time, these very writers, if asked how to prevent swarming, would say, "Give plenty of room."

Will the veterans stand up and be catechised on this point for the benefit of the order?

Why is it that some men claim to make a success of hiving on starters, and allowing the bees to build their own combs, and advise others to do the same, while nine out of ten would have the brood nests filled with drone comb and their colonies ruined?

Why is it that tiering-up is practised successfully by a great many bee-keepers, and yet there are hundreds who cannot induce their bees to do anything above the brood nest; at least a majority of their colonies prefer cooling themselves on the piazza instead of filling the vacancy above their sleeping apartments?

Why is it that some can manage to get fine sections without queen excluders, while the majority of us would have brood and pollen in the sections galore, unless we confined her majesty in her proper quarters?

In short, why is it that so much of the instructions given is not plain enough to be grasped by the mind of the average amateur or novice, and turned to practical account at once?

It may be that the object for which we are working makes a difference, and the advice that would be suitable at one time would not do for another. If that is so, why is it that the different results are not stated?

I do not wish to intimate that the statements are not correct; far from it. I believe they are not only correct, but in nearly every case the advice is given with the desire to help, and I cannot understand it unless there is a lack somewhere—some trifling act overlooked or some little preparation forgotten. And yet on these very little things has hinged the success or failure of the experiment.

For instance, one of our best writers has taken for his motto "Keep all colonies strong." Very good—extremely so in the honey season—and still it would be quite interesting to know how many of us have found that very strong colonies are not the best for wintering.

Again there are some supply dealers who do a very good business in foundation mills, and give instructions to their customers how to handle their wax. All very good as far as it goes; but if the purchaser tries to do his work in a comfortable room he will be ready to return the machine, and sell his wax for anything he can get, until he finds out that all instructions are useless unless carried out in a room where the thermometer registers somewhere from 98° to 110°.

Now, Mr. President and bee-keeping friends, I leave this with you. If this paper should prompt questions and draw out answers that will throw light on some of the difficulties above mentioned, and help some of us over the sand banks into smooth water I shall be satisfied. It will then have accomplished the purpose for which it was written.

Mr. S. Corneil: Referring to the point in Mr Darling's paper with regard to removing the queen to prevent swarming and increase the yield of comb honey, I may say that at Albany a year ago I heard Mr P. H. Elwood questioned on this matter. He stated that in the previous season he removed the queens from about 300 colonies and ran for comb honey, and let them remain in about 600. At the close of the season he found that there is a profit in removing the queens. Although Mr Elwood is a very high authority, and I have no doubt it is the best way for him, I could never see clearly how I could make it pay, and have never practised it.

Mr. J. B. Hall: I would not remove the queens because it has proved to be unprofitable. I raise my queens from the mothers which I find produce the best bees for honey gathering. I make a practise of having a large percentage of young queens. I have now over 80 per cent. of young queens in my yard.

Mr. A. E. Sherrington: I tried removing the queens last season, but lost most of my old queens. One result is that I have now mostly all young queens in my hives.

Mr. S. T. Pettit: I raise my young queens from those whose progeny have proved to possess good qualities. I would advise leaving the queens with the colonies till they are superseded, except in cases where they are found faulty.

Mr. J. B. Aches: I prefer having as many young queens as possible.

Mr. W. McEvoy: I prefer changing the existing queens for young ones every year.

Dr. Duncan: I think it would not be well to take away the queens to prevent swarming. I would allow natural swarming.

Mr. McEvoy asked Mr Hutchinson if he would put a laying queen in a hive immediately after they had swarmed.

Mr. W. Z. Hutchinson: Not usually when the honey season is only of six weeks' duration.

Mr J. B. Aches: I would introduce a laying queen in some cases.

A Member: Why is it that bees are reluctant to go above in supers or upper storeys sometimes?

Mr S. Corneil: Bees are very easily trained. I place shallow feeders under the quilts in spring, and feed thin medicated syrup, whether the colonies are well supplied with stores or not. As a result, my bees go into sections and upper storeys of frames readily, and besides this it is a good way to get hives boiling over with bees for the clover harvest.

A Member: Why is it that some can raise comb honey without queen excluders?

Mr. R. McKnight: I get my comb honey from first swarms hived on starters. I do not need queen excluders and I get mostly all good sections.

The discussion having drifted to the question of deep or shallow frames,

Mr. S. T. PETTIT said: I prefer shallow frames having heavy top bars to prevent sagging.

Mr. R. MCKNIGHT: My frames are somewhat deeper than the Langstroth. I prefer them so for their greater safety in wintering.

Mr. J. K. DARLING: I find more dampness in winter in small hives than there is where the hives are larger.

Moved by Mr. MCEVOY, seconded by Dr. DUNCAN that the *Canadian Bee Journal* be requested to send out the questions in Mr. Darling's paper to prominent bee-keepers and that their answers be published in the journal.

WOOD OR TIN FOR SEPARATORS?

A MEMBER: Is wood better than tin for separators?

Mr. J. B. HALL: Wood is better.

Mr. W. MCEVOY: Wood.

Mr. S. CORNEIL: Tin. This question was debated at the Albany Convention, some of the old hands there preferred wood because they believed it gave the bees a surface to which they could cling better. But on examining the panes of our honey-house windows, we find that the glass soon gets a coating to which the bees cling quite readily. I have found that tin separators in use have a similar coating, and I don't know of any other reason why wood should be preferred.

Mr. JOHN MYERS: I put tin and wood in the same hive and found the bees working where the wood was first.

Mr. W. Z. HUTCHINSON: I use tin when using wide frames.

FOUL BROOD INSPECTOR'S REPORT.

The following report of the Inspector of Foul Brood was read by Inspector McEvoy:

I, WILLIAM MCEVOY, Foul Brood Inspector, do solemnly declare that on the 14th of May I began my official work, and finished up on the 4th of November. The orders came in very early, and I rushed things as fast as I could, and kept pretty well up with the work considering the amount I had to do and its being scattered so widely over the province. I inspected one hundred and eighty-four apiaries during the past season. These apiaries that I examined were in the counties of Essex, Kent, Haldimand, Wentworth, Oxford, Middlesex, Lambton, Perth, Waterloo, Wellington, Halton, York, Hastings and Lanark, and in the cities of Hamilton, Guelph, Stratford and London.

After a careful consideration I believe that there must have been not less than one thousand cases of foul brood. I took the greatest of pains everywhere to explain everything very thoroughly to the owners how to cure their foul brood apiaries, and at the same time warning them that I had to burn what they failed to cure. I then expected the owners to cure their foul apiaries by my methods of curing foul brood which I believe will be followed by the bee men of every land in the near future. When I was appointed Inspector I fully expected to get every foul brood colony cured and not have to burn one hive of bees, as it was to the interest of every bee-keeper to cure and make all he could out of his bees. And I knew that if the owners did not misunderstand me, and did exactly as I told them, that they would soon cure their colonies no matter how badly they were diseased. But the time I had to get the colonies cured of a plague by all sorts of men was a much larger job than I ever

expected. Very often I had to tack around a good deal and get the best bee-keepers to go and help their neighbors or they never would have got their colonies cured of foul brood. In one locality I found an apiary of fifteen colonies badly diseased with foul brood owned by a very old lady, and the combs built every way so they could not be moved. In such a case as that, with everything out of order, I did not expect an old lady of her time of life to make a cure, and as that apiary was near some fine bee yards, something had to be done. But to burn up fifteen colonies of bees for an old lady that could not cure was something I did not like to do, so I had again to tack around. I got a good bee-keeper to buy up her colonies and cure them. The most of the bee-keepers in every locality were very anxious to get rid of the disease, and many of them would down the plague in a short time, while a few others just as anxious to cure would make some of the greatest mistakes that it was ever possible to make and still have the disease in their apiaries. In some localities I went back and found where they were making the mistakes and set them right, and explained how to finish up the curing another way. I also wrote long letters to others that had almost cured, how to cure when the honey season closed suddenly, and how to prepare for and cure foul brood colonies at once in the fall, and I am very much pleased to say that these men succeeded in curing after all. Some men that had only a few colonies of bees, and these bad with foul brood, were the very hardest to get to do anything, because they had very little at stake, and if I burned their few diseased colonies their loss would be very little, while it would be a very serious thing for the owners of fine large apiaries if these few diseased colonies were not cured or burned before the bees from the large sound apiaries robbed them. Mr. Wm. Coventry, of Woodstock, had a large and very fine apiary which cost him a good deal of money. One of Mr. Coventry's neighbors bought a few colonies of bees that had foul brood and brought them near his in Woodstock. The few foul brood colonies soon died. Then Mr. Coventry's bees robbed them and got foul brood. Mr. Coventry was very busy and had a dread of the disease spreading through the whole apiary. He then thought it best to stamp the plague out at once by fire So he went to work the past summer and burned up twenty-two colonies of bees that had foul brood. I was sorry to hear that, because these colonies could have been cured. In the most localities that I have been in the bee-keepers that had foul brood in their apiaries complained bitterly of some neighbors having foul brood colonies that their bees robbed and then got the disease. The feeling in some places ran high on account of heavy losses from the disease. I am now pleased to say that things have settled down very nicely, and that the bee yards that were once so foul are now in fine condition. I burned one colony in Woodstock, seven in Stratford and three in the county of York between Newmarket and Aurora. My time, car fare and livery hire amounted to $616.30.

Moved by Mr. McKnight, seconded by Mr. J. B. Hall, that the Inspector's report be adopted, engrossed in the minutes and filed. Carried.

THE SUGAR HONEY FRAUD.

The matter of seeking legislation to prevent the production and sale of what is known as sugar honey was brought before the meeting by the delegates from the Oxford Association, Messrs. Pettit and Frith.

Messrs. McEvoy, Hall, Frith, Pettit and Darling, spoke favorably of having a bill passed.

It was moved by Mr. S. T. Pettit, and seconded by Mr. J. K. Darling, "That whereas applying the name 'honey' or 'sugar honey' to sugar syrup fed to bees, and stored by them in combs, and the production or sale thereof is a fraud upon the people, and injurious to the bee-keeping industry, by injuring the sale of honey in our own markets and also in the markets of the world; therefore, be it resolved by the Ontario

Bee-Keepers' Association, now in convention assembled, that it is expedient, through the influence of the bee-keepers of Canada to secure such legislation as will prohibit the importation, production and sale of the fraudulent article, called sugar honey, in Canada."

Mr. S. CORNEIL: I think it is premature to seek for legislation at present. I do not think that the production of so-called honey from sugar is likely to give us any trouble in this country. Bee-keepers are very unlikely to purchase sugar by the barrel, at five cents per pound, hoping thereby to make a profit, when they can get the raw material from the flowers for nothing. As to its importation, our duty of three cents per pound at the border, added to the cost of the sugar, will take eight cents per pound out of the profits, and that will settle the question for the Americans. There is no immediate urgency for legislation. "It is time enough to cross the bridge when we come to it." Before this time next year the agitation over the matter will likely have subsided, and it will probably be then found that legislation is not required.

Mr. S. T. PETTIT: The proposed legislation is in line with that obtained to prevent the production and importation of oleomargarine. On that occasion we did not wait till the evil got time to assume large dimensions. The legislation strangled it at its birth.

Mr. R. MCKNIGHT: I would prefer that this Association pass a strong resolution condemning the fraud, and by waiting a year we shall be in a better position to say whether legislation is required or not, and if so, what provisions the law should contain. Suppose we now send a deputation to Ottawa at an expense from $100 to $200, we cannot say that we are in a position to show the Government that legislation is required to suppress an evil which has no existence in this country. We had better "bide a wee" and see how matters stand this time next year. Then if we find a law is necessary we can send a deputation to Ottawa prepared to make out a strong case, and we shall be more likely to obtain what we require.

Several other members spoke on the resolution after which it was put to the meeting and carried by a large majority.

Moved by Mr. A. E. SHERRINGTON, seconded by Mr. WM. MCEVOY, "That Messrs. Pettit, Frith and Darling be a committee to wait on the Dominion Government with a view to procure the legislation called for by the previous resolution." Carried.

After the election of officers for the ensuing year the meeting adjourned till 7.30 p.m.

SECOND DAY—EVENING SESSION.

On resuming the session at 7.30, Mr. S. CORNEIL read his paper on

DETERMINING THE SPECIFIC GRAVITY OF HONEY AND REGULATING THE PRICE ACCORDING TO ITS DENSITY.

Grain dealers regulate the price of grain, to some extent, by its weight per measured bushel. We find, in consequence, that farmers do not trust to guess-work, but consider their time well spent in measuring and weighing samples of their grains, so as to ascertain with accuracy the price they should expect to receive. Again, in many of the best creameries and cheese factories the prosecution of patrons for watering or skimming milk has been dropped in consequence of the introduction of the Babcock tester, an instrument which shows exactly the percentage of butter-fat in each pound of milk. Each patron's milk is tested and paid for at its true value. There is no longer a temptation to dilute the milk with water, to retain the "strippings," or to remove the cream. If a patron brings skimmed-milk he receives for it only skimmed-milk price. In this way every patron gets fair play.

Bee-keeping has been called "the poetry of agriculture," and as to intelligence in their pursuit bee-keepers often consider themselves in advance of those engaged in other branches of husbandry, but this claim is not borne out by the fact that, while the farmer informs himself accurately as to the true value of his grain, and the factory men estimate with precision the value of milk, according to the quantity of butter-fat, honey producers and dealers have, as yet, only got as far as to make crude guesses as to the specific gravity of honey, the principal test of quality in buying and selling being the color.

To this charge the answer will perhaps be made that honey which is left with the bees till it is capped over is sufficiently ripened, and requires no further testing. This may sometimes be true, but not always. Mr. Chas. F. Muth, of Cincinnatti, Ohio, is not only an experienced honey producer, but he is one of the largest honey dealers in America. Writing from his own experience in producing and handling honey, he says: "The fact of honey being capped is no proof of its being ripened, as we often extract very thin honey from capped cells." He also says: "It is a mistaken idea that the flavor is improved by allowing the cells to be capped. Honey gets its flavor from the source from which it is derived, and from nothing else."

Even if capped honey were always sufficiently cured in producing extracted honey it is often impracticable to leave it long enough in the hive to be capped. In the remarkably good honey season of 1883, I was obliged to extract from my upper storeys each alternate day for about two or three weeks. On one occasion I took 37 lb. from an upper storey, the result of two days' gathering. I cooled a jar of this honey down to 60°, and on taking the specific gravity I found it was already fit for market. My supposition was that the nectar was dense before it was gathered. On the other hand, who has not seen freshly-gathered honey so thin that the combs must be carefully held right side up, or the honey will run from the cells?

If this upper storey should happen to contain uncapped clover honey, when basswood commences to yield, the combs must be emptied whether the honey is ripe or not, if the two kinds are to be kept separate. If the same step is not promptly taken when buckwheat honey begins to come in, the bee-keeper will lose money through depreciation in the price, owing to the dark honey being mixed with the white. In order to keep the different kinds separate it must be clear to everyone that artificial ripening must be resorted to if we are to have all our honey of a proper density.

Water, at temperatures below its boiling point, evaporates from the surface only; therefore, other things being equal, the greater extent of surface exposed the more rapidly evaporation goes on. We may evaporate our honey in a water bath, over a stove or furnace, as is done by Mr. McKnight, of Owen Sound, but it is not always convenient to adopt that method. Besides, when the honey is hot, it is difficult to know when the evaporation should be stopped. To take the specific gravity of a sample it might be necessary to cool it down through over 100°, and before this could be done the honey in the tank might be evaporated altogether too much. The method which I have followed is to expose the honey for some weeks in large tin-lined tanks, covered with wire cloth to keep out insects, but otherwise freely exposed to the winds and the sunshine. A tank somewhat less than 3 x 6 feet and ten inches deep will hold about 1,000 lb. If a quantity of thin honey is first put into one of these tanks, and thick honey is afterwards poured in, the thin honey being lighter will rise to the top, and they will remain practically in separate strata until evaporation reduces them to a uniform density. This separation into strata of different densities does not take place when combs containing sealed honey near the top bar and freshly gathered honey in the lower part of the comb are extracted. In the process of extracting, the thick and the thin honey are thrown out of the cells almost simultaneously and become thoroughly mixed in the extractor, and while passing through the strainer-cloth tied to the honey-gate of the extractor. In such a case when they are once mixed they remain mixed, and do not separate into strata of thick and thin honey.

Farmers and others who make bee-keeping only a secondary matter produce most of their honey in the mixed form and store it at once in shipping cans. There is so much of this kind of honey put on the market that it seriously affects the price of honey

properly ripened. My object in presenting this paper is, if possible, to induce specialists to know exactly the quality of their own goods, to put no honey on the market except that which they know to be of the proper density, and to call the attention of dealers to the specific gravity in such a way that the light, unripened article will be crowded out.

In order to ascertain when honey is sufficiently evaporated an instrument of some kind is necessary. There are two or three kinds of hydrometers, either of which will do. Baume's is most generally used, and may be purchased for seventy-five cents. There is also the 1,000-grain bottle, which costs from $1.25 to $2.50, and a balance to weigh the bottle costs from $1 to $5. This is more exact than the hydrometer. Half a cent extra per lb. on a sale of 2,000 lb., obtained on account of the producer's knowing what to ask for his goods, will more than cover the cost of the most expensive outfit. All that is gained on subsequent transactions is profit.

The specific gravity to which honey should be ripened is not definitely agreed upon, but 1.370, or about 13¾ lb. to the imperial gallon, is considered by the best authorities to be about right.

Water at 60° being taken as unity, the more saccharine matter there is in honey the greater is its specific gravity, and as the price of milk is now regulated according to the quantity of butter-fat it contains, so the price of honey should be regulated according to the quantity of saccharine matter.

Last season, through disappointment in receiving my honey packages, my honey remained longer in the tanks than usual. I found it had reached a specific gravity of 1.440. Taking 1.370 as a standard, I considered I lost about $45 through over-evaporation. I sent samples of this honey to two drug firms, calling their attention to its high specific gravity, and quoting the price at 9½ cents, packages to be returned. One of the firms replied that they were already supplied, and did not want to see this honey coming into their town, but if I would send them a sample early next year we would probably have a deal. The other firm, after a few weeks, ordered by telegram 1,000 lb., the quantity I told them I had. When their order arrived I had only 600 lb. left. I sent them this quantity, expressing my regrets that I had no more of this kind. The readiness with which my over-ripened honey sold, and the price obtained encourage me to produce only extra heavy honey in future. Even if the loss in weight is not quite made up by the extra price obtained, there is a pleasure in selling superior goods, which is worth something.

One point in Mr. Corneil's paper, viz., that in extracting combs containing thin and thick honey the two kinds become thoroughly mixed and incorporated, and that when so mixed, they remain in that condition, and do not separate into strata of thin and thick honey, called out considerable opposition, several bee-keepers giving facts which had come under their notice seemingly opposed to the position taken up by the essayist.

Mr. J. K. Darling: When preparing my shipments of honey for the Colonial Exhibition in 1886, I placed what I considered good honey in open vessels in a cellar. After some time I found a layer of thin honey on the top, which I supposed had separated from the thick honey below it.

Mr. S. Corneil: In this case the honey very likely absorbed water from the moist air in the cellar. Honey has a strong affinity for moisture, and when heavy will absorb a good deal from damp air.

Mr. Wm. McEvoy: I find that the thick honey separates and sinks to the bottom of storing vessels.

Mr. R. McKnight: There must be some mistake somewhere, either as to the truth of what we are taught as to the diffusion of liquids or as to the fact that the honey in the process of extracting is as thoroughly mixed as is supposed. When honey is kept in a cool place it is more apt to separate into layers of thick and thin honey.

Mr. W. McEvoy: I have found that in the case of honey from combs not all sealed and stored in vessels, the honey near the top of these vessels is inferior, and I have sold such at a reduced price.

Mr. S. T. PETTIT: I find that honey stored in vessels grades itself into thick and thinner honey from bottom to top. When I want to get the best sample from a tank, I put a dipper down to the bottom and fill it there.

Mr. S. CORNEIL: A few years ago I put about 600 lb. of honey in a large extractor can 2 feet 10 inches in depth. After a few weeks I drew a sample from the bottom, through the honey-gate, and took its specific gravity. I then placed the hydrometer in the honey at the top and took the specific gravity there. There certainly was no difference between the honey at the bottom of the vessel and at the top in this case. I am sure there was no such thing as the honey grading itself into thick honey at the bottom and thinner honey nearer the top in this can. Soon after I began bee-keeping I had some honey in a butter firkin. I showed it to a friend who called to see my bees, and he remarked how thin it was. That was the thinnest honey I have ever seen, but I forget now the circumstances under which it was produced. One thing is certain, there is no mistake about honey which has become so mixed that it is a homogeneous mass remaining mixed. This fact is thoroughly established. If a spoonful of sugar is dissolved in a cup of coffee and thoroughly mixed, the coffee will not grade itself into very sweet coffee at the bottom and that which is less so towards the top. If there is any mistake it must be as to the fact of the honey being thoroughly mixed in the first place.

During the reading of the paper and during the discussion which followed Mr. Corneil placed a hydrometer in a jar of honey and showed how to use it. He also described the 1,000-grain bottle and how to use it. He urged the bee-keepers present to be more exact in their methods of finding the density of thin honey, so that when they come to describe it to prospective purchasers, they shall have no fears if the accuracy of their statements is tested by experiment.

Mr. CLEMENT, of Walkerton, addressed the meeting in a humorous and complimentary speech.

Moved by Mr. J. B. HALL, seconded by Mr. WM. MCEVOY, that Mr. Clement be elected a life member of the Ontario Bee Keepers' Association. Carried.

Mr. SINCLAIR, of Walkerton, was asked to address the meeting. He delivered a short, patriotic speech, full of hope and encouragement for Canadians. He was given a hearty vote of thanks.

A question was asked as to the conditions which cause honey to crystalize. The drift of the discussion went to show that the cause of crystalization is not fully understood. Nothing new on the subject was elicited.

THIRD DAY—MORNING SESSION.

As only one train a day leaves Walkerton, and that departs in the forenoon, there was not time for much business on the morning of the third day. During the hurry of closing up the business, a communication was received from Mr. H. E. Hall, of Toronto, advocating the repeal of the Foul Brood Act.

As no one seemed to sympathize with the writer in his object, and there being some uncomplimentary references in it to the President, it was moved by Mr. S. T. PETTIT, and seconded by Mr. J. K. DARLING, that Mr. Hall's communication be read four years hence. Carried.

The Convention then adjourned.

DIRECTORS' MEETING.

A meeting of the Directors of the Ontario Bee-Keepers' Association was held at Walkerton, Ontario, on Tuesday, January 10, 1893. Present: F. A. Gemmell, President; A. Picket, Vice-President; W. J. Brown, J. K. Darling, M. B. Holmes, S. Corneil, W. Couse, R. McKnight, F. A. Rose, J. B. Hall, E. A. Jones, D. Chalmers, and J. B. Aches.

The minutes of the last meeting were read and approved.

Moved by W. J. Brown, seconded by D. Chalmers, that the expenses of the Foul Brood Inspector, incurred in attending the annual meetings, be paid by the Association. Carried.

On motion the following accounts were ordered to be paid, viz.: Beeton Publishing Co., $24.50; W. Couse, salary and disbursements, $67; W. Emigh, salary, $25.

Moved by J. B. Hall, seconded by J. B. Aches, that the Treasurer be paid his travelling expenses incurred in attending the annual meetings. Carried.

On motion of Mr. Picket, seconded by W. J. Brown, it was ordered that the auditors be paid $2 each.

It was moved, seconded and carried, that the accounts of the Directors for disbursements in attending the meeting be paid.

Mr. S. Corneil expressed the opinion that, in order to furnish the members of the Association with data as to the progress made from year to year in exterminating foul brood, reports more in detail should be required from the Inspector, and that there is no good reason for keeping cases of the disease a secret known only to the Inspector and President, any more than there is for covering up cases of glanders, pneumonia, or hog cholera among live stock. After some conversation on the subject the following motion was put to the meeting and carried:

Moved by S. Corneil, seconded by J. B. Aches, that in the opinion of this Board it is desirable that the report of the Foul Brood Inspector should include the names, locations, and post office addresses of the owners of apiaries visited, and the condition of those apiaries as to foul brood at the time of the Inspector's visits.

Some further conversation having taken place as to the liability of perpetuating the disease of foul brood by the Inspector carrying the contagion from one yard to another, in the same way that smallpox and other infectious diseases may be spread by physicians, unless they disinfect their persons, it was moved by J. K. Darling, and seconded by E. A. Jones, that the President instruct the Inspector to disinfect his person, as required by statute, after inspecting foul brood apiaries. Carried.

The meeting was then adjourned, to convene again at the call of the President.

The Adjourned Meeting.

Members present: F. A. Gemmell, President; A. Picket, Vice-President; Directors —Brown, Darling, Holmes, Corneil, Chalmers, Hall, Myers, Couse, Jones, Rose and McKnight.

Moved by W. Couse, seconded by J. B. Hall, that S. Corneil be appointed Secretary. Carried.

Moved by W. Couse, seconded by D. Chalmers, that M. Emigh be appointed Treasurer. Carried.

Moved by A. Picket, seconded by R. McKnight, that the sum of $200 be appropriated for distribution among the affiliated societies; no society to receive over $20. Carried.

Moved by A. Picket, seconded by E. A. Jones, that the sum of $25 be granted to the Toronto Industrial Exhibition Association, and the sum of $10 to the Western Fair Association. Carried.

The meeting then adjourned.

ANNUAL REPORT

OF THE

FARMERS' INSTITUTES

OF THE

PROVINCE OF ONTARIO,

1892.

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY.

TORONTO:
PRINTED BY WARWICK & SONS, 68 AND 70 FRONT ST. WEST
1893.

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ANNUAL REPORT

OF THE

FARMERS' INSTITUTES OF ONTARIO.

To His Honour the Lieutenant-Governor of Ontario:

The undersigned has the honor to present herewith the report of the Farmers' Institutes of Ontario for the past year. It contains the minutes of the sixth annual meeting of the Central Farmers' Institute held February 7th, 8th and 9th, 1893: condensed reports of the various local Institutes for the year ending June 30, 1892, and a number of selected addresses delivered at various Institutes throughout the Province during the month of January, 1893.

Respectfully submitted,

JOHN DRYDEN,

Minister of Agriculture.

Toronto, May, 1893.

CENTRAL FARMERS' INSTITUTE.

OFFICERS FOR 1893.

President	Thomas Lloyd Jones	Burford
Vice-President	D. M. Macpherson	Lancaster.
Secretary-Treasurer	A. H. Pettit	Grimsby.
Auditors	Thomas A. Good	Brantford.
	George A. Aylesworth	Newburgh

Directors:

Division No. 1	A. P. McDougal	Melbourne.
" No. 2	Thomas Kells	Vandeleur.
" No. 3	J. F. Beam	Black Creek.
" No. 4	James McEwing	Drayton.
" No. 5	J. B. Ewing	Dartford.
" No. 6	T. G. Raynor	Rosehall.
" No. 7	W. J. McNaughton	Lancaster.

SIXTH ANNUAL MEETING

OF THE

CENTRAL FARMERS' INSTITUTE.

The sixth annual meeting of the Central Farmers' Institute of Ontario was held in the parlor of Shaftesbury Hall, in the city of Toronto, February 7th, 8th and 9th, 1893.

The meeting was called to order at 2.30 p.m., with the Vice-President, T. Lloyd Jones in the chair.

Moved and seconded that the minutes of last meeting as printed and included in the annual report be accepted as having been read. Carried.

REPORT OF THE EXECUTIVE COMMITTEE.

To the Officers and Members of the Central Farmers' Institute of Ontario:

Gentlemen,—The Executive beg to tender the following report: Three executive meetings have been held during the year, the first at the close of the annual meeting, when on motion one hundred dollars was voted the Secretary for extra work in connection with the Provincial Farmers' Picnic.

On motion the President, Secretary and M. Pettit were appointed a Committee to carry out the proposed arrangements, *re* picnic at Grimsby Park.

On motion fifty dollars was voted the President for travelling expenses attending Institute meetings the past year.

The estimates for the current year were considered.

The 2nd meeting was held at Grimsby Park, July 6th, when the order paper for the annual meeting was arranged and gentlemen invited to introduce the different subjects, a list of which the Secretary was instructed to forward to the Secretaries of all Institutes, with a request that they be brought before their Institutes for discussion if time would permit.

The Secretary was also instructed to invite the following gentlemen to deliver addresses during the session: Prof. William Saunders, Director Experimental Farms; James Mills, M. A., President O. A. College; Prof. J. W. Robertson, Dairy Commissioner; Thomas Shaw, Prof. Agriculture, O. A. College; Prof. James Fletcher, Entomologist, Dominion Experimental Farm.

The 3rd meeting of the Executive was held at the Walker House, Toronto, on Sept. 15th, when additional subjects were added to the order paper.

The President, Nicholas Awrey, M. P. P., was appointed to confer with President James Mills, O. A. C., in the appointment of speakers to attend Institute meetings.

On motion the sum of one hundred dollars was voted the Park Company towards printing and advertising the picnic.

Meeting adjourned to meet at 11 o'clock a.m. on the first day of the annual meeting, 1893.

REPORT OF COMMITTEE ON CREDENTIALS, 1893.

The report of the Committee on Credentials was then read and adopted.

Institute Delegate.	P. O. address.
ADDINGTON:	
Robert Nugent	Newburgh.
A. V. Price	Newburgh.
BRANT, N.:	
Alfred Smith	St. George.
BRANT, S.:	
Thomas A. Good	Brantford.
D. McEwen	Mohawk.
BROCKVILLE:	
M. J. Connolly	Caintown.
J. Franklin	Rockfield.
BRUCE, C.:	
D. N. McIntyre	Paisley.
William McBride	Paisley.
BRUCE, N.:	
J. B. Muir	North Bruce.
Thomas Smith	Tara.
BRUCE, S.:	
R. E. Little	Teeswater.
Henry Thompson	Holyrood.
CARLETON:	
Edward Kidd	North Gower.
Charles Mohr	Mohr's Corners.
CORNWALL:	
C. W. Young	Cornwall.
DUFFERIN:	
H. Graham	Whitfield.
James MacIan	Winchester Station.
DUNDAS:	
J. P. Fox	Winchester.
Thomas Carlyle	Dunbar.
DURHAM, W.:	
H. C. Hoar	Bowmanville.
James Hunter	Orono.
ELGIN, E.:	
John W. Scott	Sparta.
ELGIN, W.:	
Duncan McLean	Iona Station.
Duncan Brown	Iona.
FRONTENAC:	
Joshua Knight	Elginburg.
GLENGARRY:	
W. J. McNaughton	Lancaster.
A. B. McCrae	Maxville.
D. M. Macpherson	Lancaster.
GRENVILLE, S.:	
James Bissell	Brockville.
GREY, C.:	
J. I. Graham	Vandeleur.
John Inkster	Maxwell.
GREY, N.:	
James Smith	Owen Sound.
W. Q. Brown	Owen Sound.
GREY, S.:	
W. J. Young	Durham.
Robert Watson	Varney.
HALDIMAND:	
R. E. King	Decewsville.
Charles Walker	Cayuga.
HALTON:	
A. W. Peart	Freeman.
John Dickin	Milton West.
HASTINGS, E.:	
John Stokes	Thomasburg.
J. C. Hanley	Read.
HURON, E.:	
Thomas Strachan	Brussels.
HURON, S.:	
John Kitchen	Brucefield.
John B. Henderson	Seaforth.
HURON, W.:	
Charles Washington	Auburn.
KENT, E.:	
David Wilson	Chatham.
A. J. C. Shaw	Thamesville.
KENT, W.:	
John Longmore	Chatham.
John Paxton	Chatham.
LAMBTON, E.:	
George G. Hartley	Wyoming.
John Hunter	Wyoming.
LANARK, N.:	
James Smith	Almonte.
LANARK, S.:	
George Oliver	Perth.
William McGarry	McGarry.
LEEDS, S.:	
T. W. Bradley	Lansdowne.
LEEDS AND GRENVILLE:	
Alexander Archeson	Phillipsville.
O. Bush, M.P.P.	Kemptville.
L. Patton	Oxford Mills.
LENNOX:	
C. E Files	Napanee.
Benjamin Frink	Napanee.
LINCOLN:	
James Sheppard	Queenston.
R. W. Gregory	St. Catharines.
MIDDLESEX, E.:	
John Laidlaw	Wilton Grove.
P. D. Learn	White Oak.

REPORT OF COMMITTEE ON CREDENTIALS, 1893.—*Continued.*

Institute Delegate.	P. O. Address.
MIDDLESEX, N.:	
George T. Johnston	West McGillivray.
Peter Stewart	Parkhill.
MIDDLESEX, W.:	
A. P. McDougald	Melbourne.
MONCK:	
Samuel Kennedy	St. Anns.
Hugh Crawford	Canboro'.
MUSKOKA:	
J. J. Beaumont	Alport.
NORFOLK, N.:	
John Blaney	Lynnville.
J. H. Cole	Delhi.
NORFOLK, S.:	
A. W. Smith	Simcoe.
Daniel Woolley	Port Ryerse.
NORTHUMBERLAND, E.:	
John Armstrong	Warkworth.
George Carlaw	Warkworth.
NORTHUMBERLAND, W.:	
Samuel Purser	Cobourg.
John L. Grosjean	Cobourg.
ONTARIO, S.:	
George E. Mowbray	Oshawa.
William Grierson	Oshawa.
OXFORD, N.:	
Fred. Mitchell	Innerkip.
J. F. Wilson	Woodstock.
OXFORD, S.:	
M. S. Schell	Woodstock.
J. N. Chambers	Woodstock.
PEEL:	
D. E. Smith	Churchville.
Hugh Clarridge	Brampton.
PERTH, N.:	
William Keith	Listowel.
James Dickson, jr	Donegal.
PERTH, S.:	
William Johnston	Woodham.
W. W. Ballantyne	Stratford.
PETERBORO', E.:	
Francis Birdsall	Birdsall.
Edward Hawthorn	Warsaw.
PETERBORO', W.:	
H. C. Garbutt	Lakefield.
John A. Davidson	Peterboro'.
PRESCOTT:	
J. Cross	Caledonia Springs.
D. Hurley	Vankleek Hill.
PRINCE EDWARD:	
T. G. Raynor	Rose Hall.
Benjamin Story	Picton.
M. R. German	Picton.
RENFREW, S.:	
James McLachlan	Renfrew.
William Parr	Renfrew.
SIMCOE, C.:	
John Anderson	Crossland.
SIMCOE, E.:	
Duncan Anderson	Rugby.
SIMCOE, S.:	
James Wilson	Newton Robinson.
P. M. Faris	Bradford.
SIMCOE, W.:	
Charles Lawrence	Collingwood.
John Shields	Glen Huron.
VICTORIA, E.:	
J. D. Naylor	Fenelon Falls.
Thomas Kilgour	Verulam.
VICTORIA, W.:	
John Connolly	Lindsay.
J. W. Reid	Reaboro'.
WATERLOO, S.:	
A. Elliot	Galt.
R. C. Tye	Haysville.
WELLAND:	
J. F. Beam	Black Creek.
Hiram Goodwillie	Welland.
WELLINGTON, C.:	
William Fairweather	Alma.
W. L. Gordon	Elora.
WELLINGTON, S.:	
P. Mahon	Aberfoyle.
G. B. Hood	Guelph.
WELLINGTON, W.:	
James McEwing	Drayton.
James Lowes	Drayton.
WENTWORTH, N.:	
John Fulton	Freelton.
Thomas S. Henderson	Rockton.
WENTWORTH, S.:	
Murray Pettit	Winona.
Erland Lee	Stony Creek.
Daniel Reed	Glanford.
YORK, E.:	
Simpson Rennie	Milliken.
J. C. Clark	Agincourt.
YORK, N.:	
J. W. Hutchinson	Aurora.
A. E. Starr	Newmarket.
YORK, W.:	
J. A. Macdonald	Mount Dennis.

REPORT OF COMMITTEE ON CREDENTIALS, 1893.—*Continued.*

Other Associations.	Delegate.	P. O. address.
Agricultural Experimental Union	C. A. Zavitz	Guelph.
Agriculture and Arts' Association	Jonathan Sissons	Barrie.
	Henry Wade	Toronto.
Ayrshire Breeders' Association	Joseph Yuill	Carleton Place.
Bee-keepers' Association	Robert McKnight	Owen Sound.
Clydesdale Association	David McCrae	Guelph.
Fruit Growers' Association	T. H. Race	Mitchell.
Western Dairymen's Association	Hon. Thomas Ballantyne	Stratford.
Creameries' Association	W. G. Walton	Hamilton.
Markham Farmers' Club	Arthur Quantz	Thornhill.
Shorthorn Breeders' Association	Charles M. Simmons	Ivan.

ABSTRACT OF TREASURER'S ACCOUNT.

RECEIPTS.

Feb. 4th, 1892, Balance on hand from last Report	$ 305 96
" To cash grant from Ontario Government	1,600 00
	$1,905 96

DISBURSEMENTS.

Printing, 1892	$ 26 50
Stenographer	60 00
Delegation *re* Fruit Inspection	26 00
Expenses Executive Committee, 1892	303 70
Special Committee *re* Picnic	106 06
Grimsby Park Co. advertising	100 00
President's travelling expenses as per resolution Executive Committee	200 00
Secretary, extra work *re* Picnic	100 00
Postage, express and telegrams	26 67
Victoria Hall, rent	30 00
Salary, Secretary-Treasurer	250 00
Balance on hand	677 03
	$1,905 96

GRIMSBY, Feb. 3rd., 1893.

AUDITORS' REPORT.

We, your Auditors, beg to report that we have examined the books and accounts of the Treasurer of the Central Farmers' Institute for the past year, and verified them with the vouchers. We found all correct, showing a balance in treasury of $677,03.

ROLAND M. GREGORY,
W. COWAN,
GEORGE A. AYLESWORTH. } Auditors.

After discussion as to the Treasurer's report, some members asking for an explanation as to the President's expenses, the report of Executive Committee and Auditors' Report were adopted.

OPENING DISCUSSION.

While awaiting the arrival of the President who had been detained at another meeting, a general discussion took place.

THE CHAIRMAN: I am pleased to be able to say a few words to you. I may say I will be glad to see the day when every Province will have its Institute, and this Central Institute by merged into a Dominion Institute, where we can get together and discuss the interests of the whole Dominion. I rejoice that, although there is a depression in nearly the whole of the universe, agriculture in this province is in a more prosperous condition than in many parts of the world. We are apt at times to look at the future as through a glass darkly, but I, as a Canadian, feel proud that I belong to the glorious British Empire of which Canada is a portion.

Moved and seconded that each member be allowed five minutes in discussion of the questions presented.

Moved in amendment that each member be allowed ten minutes. The amendment was carried.

Mr. THOMAS KELLS: I have a resolution that is one of the greatest resolutions that was ever put to the people of the Dominion of Canada, and it means free trade with free England. In thinking this matter over I have come to the conclusion that it must have been an oversight on the part of the wise legislators that this matter was not attended to long ago, that is to remove all duty against all goods manufactured in Great Britain and imported into Canada. It would be very nice to ask from Great Britain some favors, but it seems to me we are not putting ourselves in a position to get anything because they allow us free trade into their markets and we put up a tariff wall against them. A flag is sent here from Great Britain and we have to pay $16 on that before we are allowed to use it. Flags should come in free, and merchandise should follow it free, and we would have better times. The resolution is as follows:

"Moved by THOMAS KELLS, seconded by F. BIRDSALL: Whereas it is desirable that better trade relations between Great Britain and Canada should exist, that is that the commerce of both countries should be more freely and fully established; further, we believe that the Government of this Dominion should be the first to move in this matter; therefore be it *Resolved*, that the Central Farmers' Institute, being composed of farmers representing almost every electoral district in this Province, memoralize the Dominion Government humbly asking them to allow all goods manufactured in Great Britain and imported into Canada to be free of duty, or as low as is consistent with the revenue of the country."

I think a move in this direction is a wise one, though I would have preferred that the Dominion Government had done so. I do not think it is wrong for the farmers to express an opinion on this point. I hold that we are, as farmers, in a better position than the farmers of Great Britain. I will now introduce to you Mr. Moffatt, ex-reeve of Glenelg.

Mr. MOFFATT: I am asked to speak to a resolution as to free trade with England. I may say I am not a delegate, but I am a farmer. We have to meet the expenses of our country very largely by the revenue of the country, and I would say, be careful when you get into this subject. See that your Local Legislature amends the assessment law so that the farmer will not have to pay more than his legitimate share.

Mr. JOHN BLANEY said that this trade question was one of the greatest that could be brought before an intelligent audience. No government can run the country without money, and this should be discussed without one party butting against the other. He was afraid that if they had unlimited free trade with Great Britain it would make them furnish the raw material and buy back the manufactured goods, selling the calf and buying the ox. He said that if the mother country could reach out a hand and say: we will give you a little better advantage than the Turk, or Russian, or other countries, then he would go into it.

Mr. D. MCCRAE, Guelph: We are the nursing mothers of this country, and we have been bled and sucked pretty dry. We have one of the best countries in the world, and I support the resolution of this gentleman, except the last clause, and I do not like to see a good resolution spoiled by the last rider. He said he was in favor of free trade with free England. I am in favor of free trade with free trade England. We are glad that England takes our goods and puts no restrictions upon them, and I think that is worthy of some response on our part as farmers in this country. I want to see immediate reduction and ultimate extinction of all duty on British manufactured goods, and I think both parties will support that position. We have the best set of farmers in this world, and we can live even with trade restrictions. During the past years the price of our products has steadily gone down, and the price of articles that we have had to buy have steadily gone up. We have not had the cheap prices that they have in free trade countries. For instance, in sugar our Government have taken off the partial duties and it brought the

price down, but still we have not as cheap sugar as they have in free trade countries yet. If we cannot raise the price of what we send out we can by this free trade take away a portion of the price we have to pay for everything that comes into this country. We know that if the farmers of this country are united we can get free trade with England almost immediately. I am in favor of giving the same privilege to any other country that will give a like privilege to us. I am not in favor of taking down the duties against our American neighbors, for they will not take away their duties as against us. I want free trade with the Americans on a fair basis, don't want the big end of the handle or to give it to them. We are not dependent on the Americans, we can live independent of them. One speaker said we must have a revenue, and that is the part of the clause I am against. The revenue can be raised, and we ought as British subjects take a pattern from England; we should put on our taxes as Britain does, fair to all, special privileges to none. We can do that and raise a revenue that will pay the management of this country if it is economically managed; we can do it anyway. How do they do it there? They put a tax on whiskey and tobacco of all they can bear; they take one or two articles and put a good duty on them that bears on every inhabitant of the country, and they put on an income tax and raise it from the men who are making the money year by year. I believe everything under $1,000 is exempt. If the farmer makes a thousand dollars off the farm he would pay his income tax of 1 per cent., if he makes $2,000 he would pay 2 per cent., and so on. I say that the combine that is making $100,000 out of this country ought to be made pay a large proportion of that back for the good government of this country, four or five times as much as if they were four separate competing firms.

Mr. Johnston: This question of preferential trade is of vastly more consequence to the farmers of this country than free trade ever can be. If England would place a tariff on wheat of 5 or 10 cents a bushel against every country in the world with the exception of Canada, what would it mean to you? That is what we mean by preferential trade. The same with beef, sheep; it would mean thousands of dollars to the farmers of this country. You will ask what right has England to give Canada any preference on this point? We have none, and if she would give us any preference at all we would be prepared to meet her, but she treats us at present as she does the United States. The American people can produce stuff a vast deal cheaper than you can, and you cannot compete with the American in producing corn and beef. If England would give us preferential free trade it would increase the purchasing power of the farmers of this country, it would raise your income, and if you bound yourselves to buy her goods you would recoup her for every cent of money that she would have to pay extra. If the price of your goods advance in England to any considerable amount you would make an ample return by buying back from her again. In lieu of buying from the United States and the whole world we would buy from them who buy from us, and we would give England the whole of our trade if she put us in the position that we have money enough to pay her for it.

Mr. Thomas Strachan, East Huron, could not see how the farmers of Canada could propose to the people of England that they should tax themselves a cent a lb. for cattle, or 5 cents upon wheat, in order that we might get a little more money for our produce. The farmers in this country are able to make their way providing they have an equal opportunity with the British or any other farmer. In taxing the goods that come into Canada it is not the people of England that are injured; it is a tax upon the Canadians. Take any single article and import it into this country, and if there is a duty upon it it has to be paid by the Canadian consumer, and by him alone. It is true that we cannot raise the prices of our surplus products, and he (the speaker) would scorn to combine and raise the prices. The farmers should demand that they shall not be taxed in what they use any greater than other classes. On the produce of the farmers the richness and wealth of this country hang. If we cannot get high prices for what are sold then take the taxes off what we buy. Is it right that the farmers should pay taxes in order to build up some industry when their own industry requires to be built up as well as any? The people of this country should imitate Great

Britain and not the United States. Lately the United States have rebelled against the high taxes imposed upon them, and it was hoped that the people of Canada would also rebel against the high taxes imposed upon them and leave this country free, and then they would not be afraid to compete with any nation in the world. The depression, he believed, was not because of not having free access to the American or any other market, but because of being burthened by taxes imposed. They should go to Ottawa, not to Washington, and demand that these taxes should be removed as far as practicable. He was not in favor of any revolutionary system; a revenue was required to be raised, but let it be raised from such things as cannot be produced here. If you want the country contented and happy, if you want to kill annexation or any other fad that is before the country at the present time, go to work and try and relieve yourselves from the burthens imposed upon you, and this country will be a prosperous, grand and noble people imitating the great country where we came from.

Mr. McEwing, West Wellington, did not believe that American farmers could beat out Canadians. He believed that they could hold their own against all countries with the same advantages. He thought they all agreed that preferential duties in the English market would be of advantage to the Canadian farmer. It came down to the question, could they get it? He said they were all familiar with the stand that Gladstone took; and Lord Salisbury the other day at the opening of a railway, speaking on this question, said the proposal to put a tax on the food products coming into Great Britain was beyond the wildest dream of any politician. He thought that effectually disposed of the probability of getting preferential duties in the English market. The question then came down to the matter of free trade, and he thought it would be a good thing for the Canadian farmers. Of course there was the question of revenue, but he thought as far as the farmers were concerned they would be willing to pay their share of that. He thought if the farmers would unite together and ask the Government to lower the duties on British imports, and lower them very rapidly—for his part he would like to see them swept away altogether—it would be a benefit to the Canadian farmer. He was not a sufficient free trader to take the duty off goods coming from a country which taxes Canadian goods. Any country that would allow Canadian goods in free it would be to the interest of Canadians to allow their products in free in return.

Mr. J. F. Beam, Welland, said he thought they were all agreed that it was absolutely impossible to get the English people to put on a duty on their imports for the sake of giving an advantage to their colonies. The English people gave Canada a free market, and was it right that Canada should put a tariff wall against them? In the reports recently he found that on $41,000,000 of imports from England the sum of $9,000,000 was collected in duty, and from United States on $53,000,000 there was only collected in duty $7,000,000. Was that right? That was discriminating against the mother country—a country that was giving them free trade while the United States were debarring them from their markets. Free trade with England pure and simple would benefit Canada. Wherever any class is favored and protection is put on it leads to corruption. England with freedom from the shackles of trade restriction is more free from corruption. We ought to adopt England's rather than the United States method. The Government of Canada have opened up the Northwest and brought these lands into competition with this Province and that is what has depreciated the value of land largely, as well as the interfering with our markets. There are no more stalwart, energetic farmers on the face of the earth than in Canada, and if these drawbacks were taken away they would be far more prosperous.

Mr. Thomas A. Aylesworth, Addington, said he wished to speak upon one point, and that was the question of revenue. He said other countries that have not a tariff such as ours do raise revenues sufficient to carry on the government. He could not say that the cost was as great or less than ours; and that it was not necessary to point that out; but this fact reaches home to our experience as a country that the revenue was raised before this tariff was commenced.

Mr. James Sheppard, Lincoln, said he was a fruit grower and lived on the border. He took exception to the statement that they should not trade with any one who would

not trade with them. He would trade with any one with whom he could trade the best. Living on the border, and where they did a little moonlight trading, he knew the advantage of buying some of the cheap American goods. Although he was willing to support preferential free trade with Great Britian if we could get it, he would be more than pleased to see a reduction in the duties now collected on British imports. He wanted the privilege of buying from the world without any duty and vexatious custom regulations.

Mr. J. P. Fox, Dundas : We cannot influence the English to give us preferential duties but they are admitting our goods free and we can reduce our duties as regards them, and that is the resolution I would support. I believe no nation can be built up without a national sentiment, and I believe the vast majority of people here are in favor of meeting the mother country in a fair spirit. We should admit the goods free from those countries that admit ours free. We should go to Ottawa and ask for a reduction in the duties. My policy would be, as soon as the manufactures combine to reduce the output and raise prices of any lines of goods, we should ask from the Government that the duty be taken off those articles.

D. McLean, West Elgin : A great many consider here that the farmers are heavily burthened by taxes, and that the farmers in the United States are more prosperous. How is that, when the farmers of the United States are more heavily taxed than we are. (Voices : They are not more prosperous). As to raising the revenue, as far as I have heard, neither political party have seen their way clear to raise the revenue other than by a tariff. If these men who have studied the question have come to that conclusion I think they must be pretty nearly right. If we can raise sufficient revenue by free trade, I would be willing for free trade.

Mr. Kells, said he would strike out the latter clause of his resolution, namely, " or as low as is consistent with the revenue of the country," also the word " humbly."

Dr. Cowan, Galt, said the farmers of Great Britian to-day were discussing the question of putting on a duty on foreign goods. Why should we not say you tax the world and deal with the colonies and we will take all the manufactured articles free that you have a mind to give us, and you will take our agricultural products in exchange. I move the following resolution, seconded by R. W. Gregory.

" That in the opinion of this meeting preferential trade with Great Britian would do much to promote the welfare and prosperity of this country."

The President : We should understand what we are to vote upon. There are two questions before this meeting. Are you as a body of farmers in favor of allowing British goods to come in here free whether they allow a preferential duty in favor of our natural products or not ? If you are in favor of that you can vote for Mr. Kells' motion. The amendment is by Dr. Cowan, to the effect that we should all like to have certain duties placed on goods coming in from United States and none upon ours. For Dr. Cowan to move an amendment to the motion of Mr Kells is to kill the effect of Mr. Kells' motion. If it carries, it would by implication declare we were not in favor of allowing English goods to come in here free of duty unless they did a certain thing. I venture to say, without going very deeply into this question, that most farmers if they understand just exactly what duties they are paying upon English goods, and how very little it required to make up the additional revenue, would perhaps vote almost as a man for it. I think Dr. Cowan had better withdraw his amendment, and allow the vote to be taken on Mr. Kells' motion, and then move a resolution afterwards.

Dr. Cowan withdrew his amendment, and Mr. Kells' resolution now reading as follows was carried.

" Where as it is desirable that better trade relations between Great Britian and Canada should exist, that is, that the commerce of both countries should be more freely and fully established ; further, we believe that the Government of this Dominion should be the

first to move in this matter ; therefore be it resolved that this Central Farmers' Institute, being composed of farmers representing almost every electoral district in this Province of Ontario, memorialize the Dominion Government asking them to allow all goods manufactured in Great Britian and imported into Canada to be free of duty."

Dr. COWAN's resolution was then put to the meeting and carried.

COMMITTEES.

The PRESIDENT : I appoint as the Committee on New Business—Mr. Mowbray, Mr. Stokes, Mr. Mohr, Mr. Peart and Mr. George Oliver.

As the Committee on Legislation—Dr. Cowan, James McEwing, Roland Gregory, Thomas A. Good and Edward Kidd.

THE PRESIDENT'S ADDRESS.

Mr. N. AWREY, M.P P., then delivered the President's annual address, as follows :

Allow me before going very fully into my annual address to congratulate you upon the very able, courteous and friendly discussion that has already taken place. From year to year as we come here I think we learn lessons of wisdom. I find this intelligent body of men getting educated up to the point of discussing public questions as intelligent men should discuss them, without a thought of what effect it may have, only the general good of themselves and the people ; that is the method we should all adopt.

It is always supposed that the President of any Association will discuss the year's work. Let me say to you I have reason to congratulate the farmers of the province of Ontario that in every electoral district except one there is now a Farmers' Institute, where some of the best men, men of most liberal thought and ideas, gather together and talk over questions of interest to themselves as farmers. Six years ago we had about three hundred members, and the Department of Agriculture tells me to day, sending out the report as they do to every member of the Institutes, they have sent out in the neighborhood of 16,000. So many intelligent farmers meeting from time to time during the course of the year have an effect upon legislation and upon the active working of the institutions of a country almost beyond computation. If you would give me sixteen thousand of the intelligent farmers of the Province of Ontario with one mind, with one common object, and that a patriotic object to do good to their country, I venture to say their power would be irresistible, if it was unitedly exercised in any direction. That is one of the results of our Institute work.

The custom is to congratulate the farmers or the members of any institution on the year's prosperity. Well. I am not one of those who believe that it behooves the farmers of this province to be taking all the time about their extreme poverty, because after all while I think we might be more prosperous than we are to day under different circumstances, I also believe, taking the bulk of the farmers of Ontario, they are just in as good a position man, for man, as the farmers, perhaps, of any part of the habitable world. But let me go further and say that under different circumstances, with our superior climate and our advantages in other respects we might be the most prosperous people on the face of the earth, and that is what we strive to attain to as we work from year to year.

There has been considerable work done during the year. We had one comparative failure this year, and that was our Provincial Farmers' Picnic at Grimsby, something that gave me a considerable amount of regret. Our Secretary especially took a great

deal of pains, he and Mr. Murray Pettit, to do everything that they possibly could to attract the farmers of the Province of Ontario to one central point to hear questions discussed. Unfortunately it came just at the end of a very wet season when the farmers commenced to be able to do their farm work and they refused, very righteously perhaps, to sacrifice their material interests in the loss of a day or two in haying time; but the few farmers that were there had a great treat. Dr. Burns, a clergyman, a man who has no interest one way or the other, other than in the common interests of our common humanity and our common country, at the close of those addresses, asked permission to get upon the platform at Grimsby Park, and he declared that those addresses to which he had been listening for the two days that our picnic continued were the most valuable contributions to the kind of literature that should be read by the Canadian farmer to which he had ever listened, and he paid the farmers and their representatives there the great compliment of discussing these questions more scientifically and sensibly than he ever had heard questions of theology discussed at a meeting of clergymen of any body in Canada. Let me tell you those who were absent missed a great treat. There were five or six of the finest addresses to which I ever listened on questions which appealed directly to you farmers. We had a great many ladies there, for the bulk of the audience were ladies, and some of the more interested farmers from all parts of the Province but the number was to small. It is a question whether the results justified the expenditure, some would say, yet I venture to say the work that was done there, even to the two or three hundred men that did listen to these addresses justified us in the efforts we made to have a picnic. I regret that we had not ten thousand people there. The beautiful park lying along the waters of Ontario was prepared to receive and accommodate some 8,000 or 10,000 farmers. While I say that we are not as prosperous as we might be, that wheat is at a very low price, that our markets have been comparatively limited, yet if we as sensible men study the history of our country we do not require to be entirely discouraged with the results of what the farmers have done in this Province during the last 20 years. Perhaps it would astonish you if you were to sit down and calmly think of the vast amount of capital that is being handled from year to year by the farmers of this Province, and the large amount of money that is invested in purely agricultural pursuits in Ontario. Would you believe that over $900,000,000 is invested in the Province of Ontario in land, stock, implements and grain. There is that much capital controlled by the men who are supposed by some people after all to be the smallest factor in our national government. How has this increase taken place? Slowly and against adversity, not with the rapidity in the accumulation of wealth that we should all have desired, but it shows a gradual increase, indisputable evidence that the farmers of this Province are men of determination, of energy and of ability to succeed even against adverse circumstances.

There are two industries in this Province that have saved us from financial bankruptcy. That may be a strong statement for me to make. When I tell you that to-day in this Province, with the millions of wheat that is being grown, that we are losing money in cultivating and selling it at 65 cents a bushel, and were it not for two or three industries during this last ten years a commercial crisis would have swept over this country that would have paralyzed the people, and you men and others in the same line deserve the credit of preventing that. I refer to the dairy interests of this Province. Can you conceive for a moment the amount of money that has come into the pockets of the people of Ontario from the old land during the last ten years? $60,000,000. What would we have done during the last ten years if that sixty millions had not been circulating in the Province amongst the farmers? We simply would have been paralyzed, our business arrangements would have been so affected that we could not as a people have paid our debts and kept the commercial wheels running, because, after all, commerce depends upon our success, and see how gradually and yet surely this industry has continued to grow. In 1859 we did not have enough cheese in the Province of Ontario to feed the farmers who like to eat it, and the consumer; that is not very long ago. In that year we bought 760,000 lb. of cheese to eat in the homes of the people of Ontario. In 1871 the first Dairymen's Association was formed in this Province, and in that year we only sold $373,938 worth. Now, in 1880, and that is not 20 years, there was manu-

factured in Ontario alone, and for which the farmers got the money directly into their pockets, $7,089,959 worth of cheese, and last year, scattered as you are all over the Province, you got $8,915,684 just for your cheese alone in the Province of Ontario, showing a remarkable progress where a system had been adopted, where people used their brains, their energy, their forethought, and manufactured the best article for the consumers in the old land.

What has been the history of our butter? That is encouraging in one respect. In 1881 how much do you suppose we sold of butter? We sold 17,649,491 lb. You would have imagined, with proper treatment, manufacturing the proper kind of butter, that that should have continued to increase, but, strange to say, from that year it commenced to decline, went down year by year until, in 1889, we only exported 1,780,765 lb. of butter. But then what has commenced? The same forethought, the same energy, the same determination of dairymen to do something better. They commenced to manufacture butter on the co-operative creamery principle; and what is the result? In two years after a uniform quality of butter was manufactured, and the people of the old land and the United States got a taste of our creamery butter and of its excellent quality, our output increased, until last year we sold 2,000,000 lb. more than we did two years ago, and we brought into this country $300,000 more money just for butter than we did two years before. This is a lesson to us as farmers to commence to change our cheese factories at the close of the year, when we cease to make cheese, and convert them into creameries, and do as little Denmark does with no more cattle than we have. Let us, in every factory where we can, manufacture butter upon the same principle in the winter time as we manufacture cheese in the summer time, and have it of a uniform quality, and the same results will follow as in cheese. Great Britain buys from Denmark 65,000,000 lb. of butter, and she is as ready to take our butter to-day if we will manufacture it of a uniform quality as she is to take that of Denmark, and there is a possible market there where we farmers can just as well get $8,000,000 or $9,000,000 for your butter as to get $300,000 now. Is it not worth trying? Is it not encouraging to think that upon proper lines we can do that work? That is not all. Twenty years ago we had in Ontario horses that were valued at $14,000,000, and mind you a fair valuation was put upon those horses, larger than the valuator was justified in putting upon them. Twenty years afterwards, in 1891, we had $33,922,950 worth of horses, and they are only valued at about $30 each. If we had a market to-day for our horses, improved in quality as they are through the enterprise and good sense of the farmers of Ontario, we could within two years simply rake into the pockets of the farmers of this Province some millions of dollars. We have the stock of a better quality, not very many more in number, but properly bred, until to-day in that one industry alone, on account of the intelligence and the energy of the farmers of Ontario they have increased their value almost double by proper principles of breeding.

Then, as to cattle. In 1871 the cattle of this Province were valued at $13,000,000, valued by the assessor, and, mind you, the assessor was the servant of the people. At that time taxation was placed upon cattle, and their desire was to raise as much money as they could out of the stock, as they did out of the land, and they valued the cattle at $13,355,233. In 1891 these cattle were valued, and the estimate was put very low, only about $30, taking the thoroughbred Durhams, Devons, Ayrshires, Jerseys, Guernseys and Holsteins and all, and yet we have in Canada to-day $25,724,595 worth of cattle.

In sheep there are not perhaps two per cent. more than there were twenty years ago, yet on account of the purity of the breed the value of the different kinds, your Shropshire, Oxford Down, Southdown, your sheep to-day, that were valued in 1871 at only $3,000,000, are worth $6,775,000.

In swine there has been an increase. Twenty years ago they were worth $1,749,000, and to-day $5,781,000, simply because you breed a better class of pig. Twenty years ago the old razor-back pig was running along the side road and used to slip sideways through the fence and rob the cornfield, and was not fit to be called a decent pig; but to-day we have them round, plump, well-bred, well-proportioned pigs that bring a good price in our own markets as well as in the markets of other countries.

In poultry, that part of the farm department so dear to the hearts of your wives and daughters (and if you are good, sensible men, you will give them the proceeds of the poultry yard—they deserve it), there is to-day in the Province $1,400,000 worth. We have a well-bred lot of hens and chickens.

In every department, under difficulties, trial and trouble, you have exhibited energy, foresight and perseverance. In fact, by the good sense you have exhibited in your methods of breeding you have doubled in value the price of stock, although you have increased very little in numbers. England has scheduled our stock, and I think they did an unwarrantable act when they scheduled Canadian cattle. I do not believe there is a disease in Canada to-day that would warrant the Department of Agriculture in England in scheduling our cattle. Now we are placed in this very awkward position. We are scheduled by Great Britain, and by the United States less than three days ago. We have no advantage over the American now in getting our cattle into England. Although England had scheduled our cattle, their not being scheduled by the United States allowed us a choice of routes to ship our stock. We could go to New York or Boston. But to-day we are placed at the mercy of the owners of the steamers on the St. Lawrence route, and the result is that Canadian shippers are compelled by the action of the English and American Governments to pay any price the ship owners along the St. Lawrence see fit to charge. You are at their mercy. You have no advantage across the ocean, and you are laboring at a great disadvantage here. It makes one feel that that spirit of manhood that should be in the bosom of every Canadian, should be aroused, and that we should say to the people of the United States we can live in spite of what you may do; that there is sufficient energy, enterprise and British pluck and perseverance in the farmers of the Province of Ontario; that in spite of the drawbacks that you have placed upon us as to your markets and scheduling our cattle we will live independent of you, and we refuse to be driven into annexation. (Applause.) I would like to say to Prof. Goldwin Smith, who has in the last three years announced in the American papers that there was a large sentiment of annexation amongst the farmers here, that I think I have been amongst the farmers as much as any other man in the Province of Ontario, and I venture to say that there are no men who value as much their birthright and the heritage they have in the history of Great Britain, in her language and in her traditions more than do the farmers of the Province of Ontario. And if they were polled to-day I venture to say that there would be an overwhelming vote of the farmers who would say that we refuse to be coerced, and that if our position may be bad to-day that we would have it infinitely worse before we would change our system of government. I believe just now they feel they can live alone independent of the people of the United States. Now is the time, I think, when as farmers of Ontario we ought to commence to look to England and say we will give you some advantages, too. I am one of those who would like to have free trade the world over. I would like an entrance to the markets south of us; but if we cannot get it there let us give England the right to place her goods down here as freely as she allows us the right. Let me say that the very moment we allow English goods to come into Canada free of duty, that moment we bring the American people down upon their knees, and they would be compelled to reduce their tariff. I care not what any politician may say, if we allowed English goods to come in free, that moonlight trading that Mr. Sheppard spoke of would continue, for it would be impossible to keep the people from getting the English goods when they could get them here in this country; they would smuggle them into the United States, and they would be very glad to give us a little more freedom of trade. Then, as to the scheduling of the cattle by the United States, it won't affect us very much, for we only sent $21,000 worth last year; it is not the price, not the amount of money we lose, it is the amount of money we lose through not having a choice of routes to ship out cattle.

Let us see what we do with England. I am going to give you a few articles; you all use the goods; you are wearing them; you are having them on your children's backs from day to day; they are household necessities; you must have them to keep yourselves and your children clothed; you buy them and we import them irrespective of the duties that are placed on them. We imported from Great Britain last year $41,000,000

worth of goods; that is what we paid for the goods in England; that is what they would have cost us without the duty; but what did they cost us? The duty was $9,000,000, making them $50,000,000. That $9,000,000 came out of the consumers' pockets in the Dominion for those goods that we got from old England. And see what they are, I will give you a few samples of them. We imported of woollen goods $1,670,000 and we paid $550,000 duty on that, that is we paid about 33⅓ per cent. duty. In flannels we bought $860,000 worth, and we paid $62,000 in duty. In hosiery, shirts and drawers $729,000 worth and paid in duty on them $225,000; that is what we paid our merchants who imported them from the manufacturers: the merchant had to pay the duty and he could not sell them for nothing, he had to pay the duty and he had to get it from us. In cotton, printed and dyed, we purchased $1,281,000 worth of goods and paid $416,000 in duty. In tweeds and cotton we bought $1,453,000 and paid nearly half a million in duty. There are some articles, I am bound to say, if we are going to have a duty and must have a duty we should discriminate in. We might fairly say to the English people who manufacture these goods, while we cannot let all your goods in free of duty there are certain lines of goods we can. And in those goods that I have enumerated to you to-day—the stockings, drawers, woollen shirts that you and your families wear—you could have saved, if it were not for the duty, $1,774,000 on these few articles of home consumption of every-day use to protect us from the inclemency of the weather. To the motherland first should go from us as farmers the offer that her goods should be allowed in free. If we cannot get free trade with the United States let us have it with England; let us get it where we can. I tell you it won't be very long before the people of the United States, as I said before, will be very glad indeed to have a larger exchange of commodities when they find we are getting English goods and they cannot sell us their goods because we were allowing them to come in free from England. It is selfishness, it is part of human nature, and the people of the United States to-day, I regret to say, act not as statesmen but more as demagogues, and politicians are simply using their powers as a party just leaving power on account of being punished by the people for attempting to punish the farming community, not only in their country but in this Canada of ours. If they think they can ever coerce the people of Canada into annexation they are mistaken. You might attract a fly with honey, you never can with vinegar, and I believe the Canadian people will resent every effort that is made by the people of the United States to force us against our will into closer relations with them politically. We are willing to trade with them, but not willing to live under their form of government. We can work out our own destiny, for after all we have as fine a country as the people of the United States have within their borders. Let me tell you another thing, and that is it will not be very long ere they will have to commence to occupy our territory. If you look over the United States to-day you would find that their vast wheat-fields were pretty well occupied and as their sons come up—and I hope each man will have four or five of them—they will want to go from home and get a farm, and as they cannot branch out in their own country very much longer they must seek homes in our great North-west, where there are millions of acres of land asking the people to come there and cultivate it. I venture to say, before long the people of the United States will be coming over as peaceable citizens of the western part of this great Dominion of ours, and if we are only true to ourselves, true to our country, true to our principles and true to our traditions, we have no need to fear the people south of us.

We ought to have the duty off binder twine. If I were selfish I might perhaps wish that the duty be not taken off, because I have some stock in and am a director in a binder twine manufactory in Ontario. But we propose to work upon different principles—to sell to the farmers of Ontario our binder twine at a price that will compel the monopolists to sell at the same rate, or we will have the entire market. In addition to what the Brantford people are doing, the Ontario Government is to-day running sixty spindles at the Central Prison where they are manufacturing a very fine quality of binder twine, and they intend to sell it to the farmers of this province at cost. They are determined, duty or no duty, that that monopoly shall be crushed out, so far as its

connection with the farmers of this province is concerned. It may be that a combine can fight one manufacturing establishment, but when they undertake to fight the Government of a Province they will find they have as much money at their back.

A MEMBER: What will the cost be?

The PRESIDENT: I think we can manufacture it for 9, 10 or 11 cents, and it won't be full of oil. In a pound of binder twine there will be over 700 yards. It is a fine manilla twine, just as small as it can be manufactured in the interest of durability, so that you will get the pure twine. So that this year you can snap your fingers at the binder twine monopoly, whether the duty is on or off. Then I think you ought to ask for cheaper light. When we are pruning and lopping off the "mouldering branches," I think we ought to lop off the duty on that which lights the homes of the Canadian farmer; I refer to coal oil. I know in some parts of this Province it may not be popular. I venture to say, when you take into account that the Americans buy the best kind of coal oil for 8 or 9 cents a gallon and you are paying 25 or 30 cents a gallon for it, you, as farmers, burning as you often do, the midnight oil to improve your minds after a hard day's work, ought to demand from the Government that you might have the privilege of lighting your houses without paying a heavy tax. I will tell you what tax I pay on coal oil, for I know exactly each month what the bill is. We generally sit up late at our place, and it takes five gallons of coal oil each month, and we pay 25 cents a gallon for it, and I can buy the same oil, if it were not for the duty, for ten cents. The result is that I pay $9 of a tax on the coal oil that I burn in my house every year, and perhaps some of you pay a great deal more.

These are questions broad enough for the people to consider, altogether free from politics, because I venture to say that to-day there is no political party in this country that is not now wishing to know the opinions of the people: and a true statesman, I care not whether he be Grit or Tory, watches the signs of the times. I have been in politics long enough to know that if the Dominion or the Ontario Government see that popular opinion is running in any particular direction they propose to give the people what they want, and you do not need to turn either party out. Let us be free men, with our own opinion, and not afraid to express it. I know that the Dominion Government to-day, led by an astute man, is anxious to know whether you farmers in the Province of Ontario want the duty off coal oil; and if all over this Province you say to the leader of the Government, "Give us free light," he won't care for two or three interested parties, but he will be looking out for his own political existence, the same as I do and the same as any other politician does. You are the power behind the throne, as you direct, so must political parties move: the politicians are nothing more than your servants, to do your bidding, to do what is good for you, and the moment that either Government does what you do not consider right, you have the power, if you have the manliness, to put them out. (Applause.)

Now, these are the subjects that, irrespective of political considerations, we should all think about, and I think if we would forget just for the moment that we are politicians we all would ask for this. And I will tell you another secret: if you all ask for it you need not change your vote, for every one of us, Grit and Tory, will be in favor of having free coal oil.

I ask you to take all these matters into consideration and consider them free from political bias. And if there is a Grit here and a good Conservative gets up and gives him a shot, take it good naturedly, and give him the credit of expressing his opinion from an honest conviction. If we cultivate that spirit it won't be very long before we will be a power in this land, irresistible, and beyond the control of politicians if they do not do our bidding. Let us be men and have as our motto "The greatest good to the greatest number." Injustice mete out to no man—ask only for justice and receive nothing less; and if we do that we will be doing injustice to no one in the province. When we do that we will have worked out our mission, helped our country and started it on the high road to prosperity. I hope to live to see the time when this Canada of ours will be

the most prosperous country on the face of God's earth, with the same constitution we have to-day, living under British law and protected by British liberty and justice. (Applause.)

Moved by Mr. MOWBRAY, seconded by Mr. BEAM, that Messrs McEwing, Cowan and McNaughton, and the mover and seconder, be a committee to take into consideration the President's address. Carried.

FIRST DAY—EVENING SESSION.

The proceedings re-opened at eight, the President in the chair.

THE NORTH-WEST TERRITORIES AND BRITISH COLUMBIA.

Prof. SAUNDERS, Director Dominion Experimental Farms, gave the following address :

I need scarcely tell you that it affords me a great deal of pleasure to be with you. I can assure you I have enjoyed the session very much. It is one of the occasions I always look forward to as a time of refreshing, when one can pick up crumbs of comfort in the way of agricultural facts that bristle out from the pointed addresses of the speakers here.

Last year, when I had the pleasure of speaking to you, I took occasion to refer to some features in connection with the experimental farm system, of which I have the direction, and I thought to-night that perhaps I might occupy a little time in telling you about the great country we possess beyond Lake Superior. The map I have here is one that I am indebted to Professor Robertson for the use of, but the wall space will only allow me to show the country from the Sault Ste. Marie to the Pacific Ocean. I have gone over the ground many times during the past seven years, but I realize I know very little about the country yet ; it is so vast that a man might spend a lifetime there and yet know very little about it, yet I probably have about as much knowledge of it now, agriculturally, as any person in the Dominion. You were good enough, sir, to refer in very eloquent terms to the progress made by the Province of Ontario. But while we have been making progress in Ontario, we have also been making progress in other parts of the country. True the census has not shown such an increase in population as most people expected, yet the work is going on gradually of settlement of this great stretch of country. As most of you are aware, the progress has been greater west of Winnipeg than it has east, for the reason that within forty or fifty miles of the city of Winnipeg the prairie district begins, where the soil is exceedingly rich and fertile and where the crops are very heavy in favorable seasons. The Red River, which flows past Winnipeg, has given its name to quite a large area of country on either side, which is known as the Red River Valley. It is not really a valley in the ordinary sense of the term, but a great plain on either side of this river, which has, no doubt, been deposited under very uniform conditions for the reason that we find the soil exceedingly uniform, both in the upper strata as well as in the lower. The width of the valley is about one hundred miles, and it extends south through parts of Dakota and Minnesota. The soil is a very black sticky clay, exceedingly fertile, and with a very impervious sub soil ; as you approach the river banks, however, it becomes more loose and friable and better adapted for a variety of crops. This district is noted in some places for its saline character, that is, the water is what is called there "alkaline," and the soil is alkaline. This alkali is not soda, as a rule, nor is it potash ; it is not an alkali in the ordinary sense, but it generally consists of sulphate of magnesia or Epsom salts, associated with common salt. These two substances effloresce on the surface looking like snow, and where they exist in considerable quantities vegetation is almost entirely prevented. A few weeds seem to thrive on this particular soil ; there is one related to the lamb's quarter that you find in some of the worst of these spots growing quite thrivingly, showing that there are some

forms of vegetation that can thrive even under these discouraging circumstances. The lack of settlement in this district, as compared with the district further west has been the subject of remark, and I think it will be found that as long as we have soils that are less tenacious and difficult to cultivate, so long will that Red River soil be in a sense neglected, rich as it is. It is well adapted for dairying, however, as it has magnificent crops of grass, and a large part of the hay which is sent to the Winnipeg market, and which supplies the settlers around, is grown on that Red River soil.

West of the Valley, as you approach Portage la Prairie the country rises. The Portage is directly south of Lake Manitoba, which although it looks small on the map, is a large lake and has a very decided influence on all the country immediately adjacent. The Portage plains are perhaps the most constantly prolific in grain-yielding power of any part of the North-west, not so much on account of the superiority of the soil, but from the fact that they are almost always preserved from the influence of late frosts on account of the air blowing over this body of water being tempered before it reaches them.

Most of you have heard of the "Great Fertile Belt." It extends 800 miles from Lake Manitoba to the foot hills of the mountains. We do not know how far north it goes, probably three or four hundred miles. Edmonton is in the middle of that belt; Prince Albert and Battleford are also in it. Last year a large part of the settlement from South Dakota, something over 2,000 people went into the district between Prince Albert and Edmonton. The soil there is exceedingly fertile. A sample from Yorkton was sent to the Experimental Farm for examination last year, and if you consult the last report you will find the particulars of that analysis, which showed that not only was the soil itself, which is exceedingly deep, very fertile, but that the sub-soil was about as fertile down below as an ordinary soil; that is it contained in suitable proportions for the growth of plants the three important constituents, phosphoric acid, nitrogen and potash, and in sufficient quantity to produce good crops even if the top soil were entirely removed, showing the immense store of fertility that lies in that great belt of land. There is no doubt that if the Canadian Pacific Railway had been run further north, that the settlement all through that country long before this would have been much greater than it is. They have their drawbacks however—what part of the world has not? They have found by experience that it does not do to put all their eggs in one basket. It does not do to go into wheat growing on a large scale and depend on that alone. In the neighborhood of Qu' Appelle is the Bell farm, 60,000 acres, and several other farms on which wheat is grown on a large scale. These farms are managed, in some instance, with a great deal of success and there is a large profit attending them when the seasons are successful. But after all, farming in the North-west where the man limits his work entirely to the growing of grain is, in a sense, gambling, although perhaps I should not so designate it. But it brings about the same sort of spirit A man tries his luck, if he has good success, he perhaps doubles his venture next year; then if he has poor success he is always of the opinion that it is bad luck this time and he will give it another trial. So the thing goes on from year to year, and while some accumulate quite large sums by these operations, others are not so fortunate.

The true and best system of farming for all that country is mixed farming. It takes some time to get into it, because farmers go in with little or no capital, and it is easier to grow grain and cover a large area than to do anything else; but everywhere the farmers are working into stock, and with the increase of stock will come dairying and the converting of the coarser grains into the more concentrated animal products. In this way, when there is a bad season for grain a man will have his cattle, hogs and poultry to fall back on, and will always have more or less revenue. When mixed farming comes into general practice all through that country, we shall hear very little of failure. It is a magnificent country and there is no place where sufficient moisture falls to ripen the grain, but what an industrious and energetic man can get along and make a good living.

As I told you last year, at Brandon is one of the experimental farms. That is the farm which is in operation for the benefit of the Province of Manitoba, and it was placed there for one reason, that it is in the centre of one of the largest wheat growing districts. Extending north to the M. & N. W. Railway, south to the boundary line, east at least

as far as half way between Portage and Winnipeg and west again to the boundary line, with some few exceptions here and there of a light gravelly character, the land is a rich sandy loam, admirably adapted for the growth of wheat. Settlers going in first of all naturally thought the wisest system to adopt was to farm as they had done elsewhere; many farmers who prided themselves in Ontario in plowing a good deep furrow, carried out the same practice there. In the neighborhood of Qu' Appelle a good Scotch farmer who was sent out by the company had a steam plow and insisted on plowing eight inches deep from the start and thought by that process he would astonish the neighboring settlers with the magnitude of his crops, but contrary to his expectations, failure was the result every year, as long as he followed that process. It is not, perhaps, easy to offer a full explanation of the reasons why, but it has been found in practice that the best method first of all is to simply skim the land, a wide shallow furrow of about two or three inches; that is what they call "breaking." Then after that, plowing three or four inches deeper and burying the sod with the upper side above again. This is the form of seed bed which the farmers of Manitoba by long experience have found to give them the best results. Both in Manitoba and the territories it has been found best to sow the seed on summer fallow. That summer fallow is made in July, sometimes in June, but not later than July, so that they turn under the moist soil which has been soaked by the June rains and in that way by burying this somewhat deep they economize moisture and keep the soil in the condition that is favorable for carrying the crop through the next season.

Leaving Manitoba you enter the Territory of Assiniboia, which must be about 450 miles long and 200 or 250 wide. In the southern part the land is very much the same as in Manitoba until you arrive about half-way to Indian Head, then it begins to get drier and there are seasons when the moisture is not sufficient to carry the crop through to advantage. For this reason the summer fallowing is very much more important in the territories relatively than it is in Manitoba. At Indian Head this year, although the rainfall during the growing season has not been over seven inches, we have had magnificent crops of wheat, the finest sample we have on any of our experimental farms, weighing 62 and 63 pounds to the bushel. On the other hand there are careless farmers within a few miles of the farm who have undertaken to sow their grain on the stubble and use their disk harrow to cover it, and they have had about five and six bushels to the acre, and I think they may consider themselves lucky to get that. We sow some plots carelessly in order to show the difference between treating the soil properly and improperly. Seeing is believing, as the old proverb says, and if the farmer sees the result before his eyes he must believe it no matter how unpleasant the truth may be in comparison with his own crops. We are also carrying on experiments there with fodder crops. At Brandon corn succeeds very well, and we are able to get very good crops for the silo. At Indian Head however, there is not sufficient heat or else the climate is unsuited, I don't know which, but we have tried it with several varieties and the squaw corn and early Corley are about the only varieties we have been able to bring to any degree of perfection. Of course we shall continue these experiments for many years to come, but in the meantime we shall recommend farmers in that district to grow grain for their cattle. By using judicious mixtures of grain, and cutting them in a green stage, curing them as hay and putting them into the barn they can have a sufficient quantity of food for their cattle for the winter months with very little trouble; and if it is found best to place this material in the silo they have ensilage of a very good quality and at a very small price. We have been trying a mixture of spring rye, wheat and oats and generally vetches, and we have had three and sometimes four tons to the acre. This has been a very useful experiment to the farmers, because with the settlement of the country going on the hay lands were being taken up, and some of them had to drive twenty and twenty-five miles for native hay. This solves the problem and also prepares the way for the extension, in that country, of the dairy industry. Six years ago when I first visited that country, when we discussed dairying the farmers said, "There is no use discussing that; we cannot grow timothy or clover and the wild hay will not hold out as stock accumulates." Now all that is removed, and I look for great progress in the manufacture particularly of butter in that country within the next few years. Already several creameries are established both in Manitoba and the territories. A friend of mine has one near Indian Head, and he tells me he gets 23

cents a pound on the station platform. I do not know whether such a price can be kept up, but there is not much doubt with the facilities we have for carriage that the farmers can realize an average of twenty cents for dairy butter for a long time to come. The cost of carriage from there to England would be comparatively light, one to two cents a pound would cover it from any part of the North-west to Liverpool.

When you pass Indian Head you strike a sandy belt for about twenty miles, and then a great belt of clay covering hundreds of square miles. This clay is extremely fertile and when there is sufficient rainfall there are always good crops both at Regina and Moose Jaw, 60 miles further on in the same belt of clay. This soil when it is worked up becomes quite granular, and although it seems to suit for the cultivation of wheat, it would take a great deal of working to reduce it to that degree of fineness necessary for the covering of such seed as clover, so that while it has its advantages in fertility, it has its drawbacks also.

Above that you strike a soil altogether different. You get into that fertile belt I have been speaking of and there is almost invariably a rich black sandy loam with patches of trees and great stretches of prairie between, and the country being broken and partly wooded is also much better watered, so that it is a very fine country for mixed farming and pasturing. The grass grows very much longer than on the southern plains, and the growth of grain is quite as rapid, and the grain is ripe just about as soon at Prince Albert as at Indian Head. Beyond Moose Jaw the country becomes very much drier, and between there and thirty or forty miles from the foot hills seems very barren. It grows a great variety of grass, however, and although the growth is short yet the grass is nutritious and affords abundance of food for very large herds of cattle and horses. The Bow River District is where these large ranches are of Cochrane's and other breeders. From Calgary to the boundary line they allow their horses to run out all winter without any sort of protection. I was paying a visit to a gentleman at Fort McLeod a short time ago and he drove me out with a very nice horse. I asked him what he did with his horse in winter and he said, "I just let him loose and never see him again until spring when he comes in fatter than he went out." He said that was the common practice all through that country. The horses paw the grass when there is any snow on the ground. The Chinook winds are of frequent occurence, and the snow very seldom lies on the ground for more than a few days at a time, and so the cattle and horses find abundant pasturage for the greater part of the year.

Beyond Prince Albert I cannot tell you much about the country from personal observation, because I have not been more than twenty or thirty miles around that district, but lately I received some samples of grain from a fort north of Prince Albert, and I received last week from the people at Dundegan samples of wheat that would weigh 62 and 63 lb. per bushel, and I got some of the finest samples of two-rowed barley that I have seen in Canada. It was about 53 or 54 lb., very bright and mellow in appearance, and just the kind the English brewer wants. But I do not know what quantity can be grown. It is not safe to draw any conclusions of a general character from these isolated points, because the Hudson Bay posts are generally in river valley, where the soil may be like the surrounding country or it may not ; but we know this much, that 400 or 500 miles northof the Pacific Railway grain can be grown and ripened of a first-class quality, so I think it is safe to presume that a very large stretch of country lies between the present settled lands away north which will make fine homes in the future for settlers. At this point you are, of course, at a much greater altitude. At Calgary, I think it is about 3,000 feet, and from that on you rise until you get to the top of the Rockies.

I will refer to some of the peculiar features of British Columbia. It is one of the most perplexing countries to give an opinion on that I know of. The mountain ranges are not shown on this map, but the coast range extends from 70 to 100 miles east of the ocean. All the land beyond that coast has a climate like that of England. Our Experimental Farm for that province is situated at a place called Agassiz, seventy miles from Vancouver. We have there 300 acres in the Fraser River Valley, and north of that is a low mountain range running up from 800 to 1,200 feet, so that the farm is sheltered, as most of the land in British Columbia is, either on the one side or the other In the valley land such plants as the English laurel and holly winter outdoors perfectly. The

Rhododendron winters there and survives in a way that is quite charming. The many hued evergreens from Japan and the south of Europe find a convenient place for their growth and develop rapidly, and I think it will not be very long before we shall have at that place one of the finest collections of ornamental trees and shrubs to be found in the whole Dominion. And I think it is wise that we should have them there for the reason that the sight of these shrubs and plants has a stronger and more persistent effect on visitors in indicating to them the character of the climate than anything else you can plant. You may talk to a person as much as you please about the mildness of the climate and they may not take all you say for gospel, but if they see the holly, the laurel, and the yew tree growing outdoors without any injury, they know the climate must be very much like the climate of England. The rainfall was about 62 inches last year, which is about 50 per cent., speaking roughly, more than we have in Ontario; so that the growing season is a very long one. I had a letter from our superintendent a few days ago asking me to hurry up the seeds as he expected, from present indications, to begin plowing in February.

Apple, pear, plum and cherry trees grow there with luxuriance. I have seen shoots of six inches long on young trees in a single season. We have on that farm 887 varieties of fruit, 569 of large and 318 of small fruits. Before the railway was completed the farmers depended upon the nurserymen of Montana and Washington. The trees were not true to name, and the farmers not knowing what varieties they were growing, have been negligent, and in addition they had no market. On my first visit, I found pears strewn over the ground, rotting. Now all is changed, orchards are being planted, and the valleys and hillsides in many localities are covered with thousands of young fruit trees, which, in a very few years will give such returns that the Province must either become the centre of a large fruit drying and canning industry or they must ship their fruit east or west.

I mentioned to you last year, but it will bear mentioning again, that although that country has such immense resources as far as timber is concerned, yet it has no hard woods, and this is a great draw-back to manufacturers. A carriage factory has to send to Ontario and carry the wood 3,000 miles. We have commenced planting black walnut, hickory, elm, ash and all the valuable eastern woods on the broken sides of the hills where we find a sufficient amount of earth in the crevices of the rocks, and we are also trying them in the valley lands below. With the rapid growth of trees in that country a very few years will determine the value of that experiment. It has occurred to me, however, that with such rapid growth the wood may not be of uniform quality, but the experiments of Professor Furneaux, chief of the American department, and one of the best authorities on the continent, go to show that the quality of these hard woods when the growth is rapid is superior to when it is slow.

A Member: Can you ever hope to produce apples east of the Rocky Mountains, between there and Winnipeg.

Prof. Saunders: The results we have had with apples as far west as this have been exceedingly discouraging. I suppose we have tried probably 200 varieties, but we have not found a tree that will endure the climate. There are periods in the winter and early spring when the changes of temperature are so great that the rising sap or budding leaves are frozen. In connection with the forestry work there we are providing shelter belts. We have a belt 100 feet wide of native trees on the western and northern boundaries—of trees raised from seed gathered in the valleys near by. These trees, of course, are perfectly hardy, and in their shelter we are beginning to have some success with the Scotch spruce, Raga pine and Norway pine. This year we have about three tons of seed collected, which we are putting up for distribution in these districts. In Brandon we have planted about 3,000 trees on a large belt on two sides of a farm similar to that at Indian Head, besides avenues and wind-breaks at other points on the farm. We are also trying the plan of laying out the land in squares of from one to two chains wide, and running rows of native trees down as enclosures and cutting them down to the height of a hedge, but eventually intending to bring this up to the height of about 8 or 10 feet. We find already that in the shelter of these hedges, although perhaps not more than 4 or 5 feet

high, we can grow small fruit such as currants and raspberries a great deal better than they can be grown on the open plain. At Brandon we have a number of varieties of apple trees growing, and this year had specimens of the fruit. We have also had a quantity of small fruit grown on the farm and sold in the city. The soil there is of a light character, and that is perhaps the reason why we have succeeded better than at Indian Head. At Indian Head the thermometer has touched 40° this winter, and I have known two or three weeks when it would not rise above zero. While the cold is dry and you do not feel it as much as the same degree of cold down here, yet it has its effect upon tissues of plants and trees, and is hard for them to endure. I am of opinion that the best success will attend fruit planting in Manitoba and the North-west on poor soils that are not considered fit for grain growing, and that experiments would be more successful on such land than on the richer soils of the plain.

Along the foot hills of the mountain, and as you get up into the higher points, is where these great discoveries of anthracite coal have been made. Some years ago I counted, I think, 40 or 50 veins of anthracite in 400 or 500 feet on the side of the mountain. I brought home some samples of cannel coal from a vein 20 feet thick. Near Banff, coal of a very good quality of anthracite is being found, and there is every reason to anticipate that a deposit will be found which will perhaps surpass the celebrated Pennsylvania deposits. All this coal is shipped to Port Moody, and some has been sent down to San Francisco, although not a very large quantity because the mines have scarcely got into working order as yet.

Between this range and the coast hills you have probably the greatest diversity of climate to be found anywhere in the world. Two years ago I drove about 200 miles through the country and found for the first 30 or 40 miles that it was possible to grow grain remarkably well without irrigation, but south of that point everything requires to be irrigated. Wherever water can be commanded crops can be grown that are surprisingly heavy, but where water cannot be had it is a bunch grass country suitable for cattle ranching. There are large cattle ranches from the Canadian Pacific Railway down to the boundary line. When you come east of the coast range the climate suddenly changes. In going 50 miles you will pass from a climate with rainfall of England to a climate that is practically rainless. Going west it is a most interesting thing to watch. You leave the sage brush and desert vegetation behind you until you are gradually led into the full vigor and verdure of that wonderful country for growth, the coast climate. The explanation is very simple. These mountains are high, the clouds laden with moisture coming from the Pacific are driven against the tops of the mountains and their moisture is precipitated, and they rise high and do not discharge any more moisture until they strike the next range, so that these lands are practically arid until they can be irrigated by mountain streams. During the past year in part of this district between the Columbia river and the mountains, called the Kootenay district, deposits of silver and some gold mines have been found. We shall have at the Chicago Exposition a large number of samples which will be very impressive and will go far towards enlightening the people of this and all other countries as to the immense resources of that district. (Applause.)

A Member : I was in British Columbia in 1864, mining, and I did not see much of the land that I considered fit for farming purposes. I found that in the mines we could only put in about three months in the year. In the hot weather the melting snow filled up the rivers, and in the winter they were frozen up. I could not recommend any of our young men to go there and prospect.

Professor Saunders : I would not like anyone to go away with the idea that I am trying to give a rose-colored view of the country. My object is to give a plain, straightforward statement of facts, yet they have been so hurriedly given that one is likely perhaps to convey a false impression. I will give you an incident on the other side. I was stranded at Dunmore, and went into a shop where I saw carrots, turnips and potatoes for sale. Upon asking the price I was told five and three cents per pound. I asked if they were not grown there, and was told that nothing could be grown there, as they had frost every month in the year. This of course was a good distance up the mountains. At Banff, for instance, scarcely anything is grown.

THE HORN-FLY.

Mr. James Fletcher, Dominion Entomologist, Ottawa, delivered the following address: I shall speak what is generally called "one word," and that one word will not last more than ten minutes. Most of you have heard or seen the name "Texas Fly." It is the popular name that has been given to a small fly that has been introduced to the United States from Europe and has spread over most of the Eastern States and at last reached Texas. It is rather important that you should get the right names of these flies, and particularly the popular names, in order that when you apply for a remedy for a certain pest, you may get the one you require. I am not going to try to persuade you to take up the study of injurious insects further than they affect your crops or herds, but when applying for information or remedies I wish you would send specimens with your letters. The interest taken in this subject has become so great that means have to be taken to reduce the amount of correspondence, and anyone can see that if you write, and call the insect by the wrong name, a great deal of time will be lost. The mails will carry your letters free of postage if you address them officially to the Experimental Farm. Any small receptacle will do to contain the insect, if packed in a tight, neat parcel. Small tin boxes will do, and it is not necessary to make holes in the boxes. In proportion to its size the insect has a greater air space in the box than we have in this room. If you make holes the insect will dry up and become hardly recognizable; while if you close up the box it will contain enough moisture to prevent this.

Every insect has a certain time for its chief occurrence; it appears at a certain time of the year; it has its reason for appearing then, and we must know its life history before we can discover a remedy. The Texas or horn-fly produces two or three broods during the season, and some of these broods will occur all through the season, so that we have constantly to be working against them to prevent their injuries. The fly is about one-third as big as the ordinary cattle fly that bites your cattle about the legs. Its bite seems to be as irritating to the cattle as the bite of a mosquito is to some people. The mosquito does not trouble some people, while others, of a nervous temperament, are driven almost crazy by it. It is the same with cattle, and the best milkers are of this highly strung, nervous temperament; but, if you are to get good results, you must keep your cattle placid and comfortable. I know of a herd being frightened almost out of their lives, simply because a woman, an unaccustomed sight to them, came into the stable.

The life history of this horn-fly has been by some people confused with that of the maggot that gets into the heads of sheep. That fly lays an egg in the nose of a sheep; the egg is hatched and the grub crawls up into the brain. It was supposed that the horn-fly laid its eggs on the horn and that the grub ate its way into the horn and thence to the brain. That is not so at all: the only injury is that the insects give the cattle no rest, so that the cattle injure themselves by rubbing until sores form. Some people have told me that they saw the holes in the horn; I have simply said, you are mistaken. What seemed holes on the horns was simply the excrement of the fly. The maggot is soft and could not bore into bone. The fly can be prevented from doing any injury by simply rubbing the animals with grease. Tanner's oil is the cheapest and is sufficient to prevent the fly from biting. They settle on the horn because it is difficult for the animal to rub them off; the object of the fly is to find a place where it cannot be reached and can bite at its leisure; but it will not settle on a well oiled spot.

This, however, is not a scientific way of treating them, since if you drive them from one animal they settle on another. But, as I said before, we cannot find a scientific remedy until we know the life history of the insect, and the life history of the horn-fly is as follows: The eggs are laid on the fresh, wet dung, as soon as it is dropped. In less than twenty-four hours the eggs are hatched into grubs or caterpillars: these pass into the third stage, in which most insects do not move; then there is the fourth stage, the perfect insect. There is no such thing as spontaneous generation. There must be a male and female; these come together, and the product is similar to the insect that produced it. That is, every insect has a father and mother, the same as higher animals have. The eggs live in the dung, and in about a week, that is, before the dung has

dried up, the insect has passed through all its stages and the perfect fly comes out. Now, what is the way to stop it? Simply produce a condition in that dung so that it is not a place in which those insects can live. This can be done by either disturbing the dung or by placing upon it some substance to dry it up. A remedy must be effective, to do the work; it must be simple, so that there will be no mistakes; and it must be cheap. I do not know whether you a use brush harrow in this country. It is composed of large pieces of brush fastened so as to drag behind a roller. Such a brush dragged rapidly over a pasture twice a week is all that would be necessary to render the dung unfit for the habitation of these insects.

A Member: How long will an application of oil last?

Mr. Fletcher: After two or three applications of tanner's oil I think it would be unnecessary to put it on again. If you use the kerosene emulsion, composed of coal oil and soap suds, it can be applied best with a force pump.

A Member: Will that emulsion do also for lice?

Mr. Fletcher: Yes, it is the best remedy. This emulsion is composed of two parts of coal oil and one of soap suds, mixed with nine times of water. It should be sprayed on the cattle with a pump and rubbed in by hand.

A Member: I found that this emulsion blistered the cattle. We have Shorthorn grades. Would it do as well if used weaker?

Mr. Fletcher: It certainly could be used weaker, but I never found it blister our cattle.

A Member: What quantity of soap suds should be used?

Mr. Fletcher: I prefer always to give the formula in print, but it is this: Boil half a pound of hard soap, or a quart of soft, it is immaterial which you use, in a gallon of water. By the time the water is boiling the soap is dissolved. You have the coal oil in a separate tub (away from the fire of course), then pour in the suds and churn the mixture. Test by drying a little on glass; if it remains without oiliness the emulsion is correct. It takes a good deal of churning to get it to the right consistency. This should be used mixed with nine to fifteen times its quantity of water. Nine is the formula I use. If you find your cattle have tender skins, make it weaker. We have some nice Jerseys with very delicate skins at the Farm, and we find that nine gallons of water to one of emulsion is not too strong.

A Member: I found that the large lice on pigs lived through this emulsion.

Mr. Fletcher: Then I should simply say, use it a little stronger and be careful to wash thoroughly.

A Member: At what intervals should they be washed?

Mr. Fletcher: Two washes should destroy them entirely. In all instances I tried, the first wash was sufficient.

A Member: Would not tobacco, or rather snuff, serve the same purpose, sprinkled on and whisked in?

Mr. Fletcher: It would do very well for Jay Gould. It is too expensive. This emulsion costs only 1½ cents a gallon.

A Member: I find the common oil very effective; it never blisters, and one application is sufficient for the season.

Mr. Fletcher: Lard has been used in the same way. This emulsion is the least expensive of all. We have tried the pure coal oil with no bad effect on the animal, but there is no necessity for using it so strong. These lice sometimes get into the cracks of the stalls; they must of course be cleaned out from there as well.

The meeting then adjourned.

SECOND DAY—MORNING SESSION.

The PRESIDENT took the chair, and called the meeting to order.

The PRESIDENT: Prior to this year we elected our officers by open voting, but last year a resolution was passed that the election be by ballot on the morning of the second day of the meeting. There are two electoral districts not mentioned in the grouping; is it your pleasure that they be attached to No. 2? Carried.

EXECUTIVE COMMITTEE FOR 1893.

The different divisions then organized, and elected the following Executive Committee for 1893:

District No. 1—A. P. McDougald, Melbourne.
" 2—Thomas Kells, Vandeleur.
" 3—J. F. Beam, Black Creek.
" 4—James McEwing, Drayton.
" 5—J. B. Ewing, Dartford.
" 6—T. G. Raynor, Rose Hall.
" 7—W. J. McNaughton, Lancaster.

ELECTION OF OFFICERS.

The following gentlemen were then nominated for the office of President: Messrs. T. Lloyd Jones, T. G. Raynor, D. E Smith, and David McCrae. Upon the third ballot Mr. Lloyd Jones was declared elected President.

Messrs. McCrae and Macpherson were nominated for the office of Vice-President, also a number of other gentlemen, who, however, withdrew their names. Upon a ballot being taken Mr. D. M. Macpherson, of Glengarry, was declared elected Vice-President.

Mr. A. H. PETTIT was elected by acclamation to the office of Secretary-Treasurer.

M. AWREY: Before I retire in favor of my successor, I have an important duty to perform. It is to say that Mr. Pettit, who has been Secretary for a number of years, has discharged his duty in a way that is eminently satisfactory to everyone. Although he is, if it is a question of politics, firmly opposed to me, yet in the discharge of a public duty he always forgot his politics and decided every question upon its merits. I can assure you that it would have been a mistake at this juncture to have changed your Secretary, for he devotes his time, energy and ability freely to the good of the Central Institute. (Applause.) I wish to thank you for the courteous treatment I have received for the past three years. At this meeting and throughout the country at the local institutes I have received the support and encouragement of every member, and I bespeak for my successor in office the same kindly treatment that I have received. I beg to present Mr. Jones to you as your President for 1893.

The newly elected officers then in turn addressed a few words of thanks to the Institute for the confidence reposed in them.

Moved by Mr. WILSON, seconded by Mr. SISSONS, and resolved, That a Committee be named by the President to draft a resolution tendering the thanks of this Central Institute to the late President for his very able and efficient services during the past few years.

The President nominated the following Committee: Mr. Wilson, Mr. Raynor, Mr Mowbray, Mr. McEwing and Mr. Hoare.

Mr. Thomas A. Good, Brantford, and Mr. George A. Aylsworth, Newburg, were elected by acclamation as Auditors for 1893.

ROAD-MAKING.

Mr. D. E. Smith read the following paper: How can we improve our system of statute labor? This is an age of progress in many lines of thought, and many of the farmers of Ontario are endeavoring to keep pace with the most advanced thought of the men of other callings and professions, and great advancement has been made during the past decade, but success in agricultural pursuits is too frequently handicapped by lack of union, lack of thought, and lack of business principles. However, such advancement has been made by many of the rural bread-winners of our fair province that in the march of progress we are forced to look beyond the limits of our farms and consider whether it would not be expedient and beneficial in the interests of farmers as a class to dispense with the present system of road-making and devise and substitute a better. Most of us believe that our present system has outlived its usefulness, and to-day there is a wide-spread feeling that something more ought to be done. This is seen by the agitation that is going on in press and on platform throughout many parts of Ontario. It is generally granted by those who are acquainted with our present system of statute labor that much time, labor, and money have been spent to little or no purpose, with very little hope of any improvement being made under the present system. The great dread of the farmer in many localities is that he may have a tax to pay, and that prejudices him against any system that has anything to do with paying tax. The right to tax is based theoretically upon the return to the taxpayer of more and better results than he can secure by the expenditure of his own money in his own way, hence the argument for the contribution to the general fund.

Bad Roads from an Economic Standpoint.

It will not be necessary for me to do more than indicate the evils arising from bad roads, because they are familiar to most of you. Bad roads add expense to our produce by the trouble and loss of time it requires to take it to the market; by the extra wear and tear of waggon and harness as well as to horses; by loss of time in taking small loads; by more frequent breakages; by the difficulty of taking produce to market during the wet season, as in spring or fall, when produce brings the best price; by the injury to small fruits, to milk and butter; in taking milk to creameries and cheese factories it entails a loss of very much time. Good roads, on the other hand, increase the value of farm property. In the State of Ohio, where they have changed their system of road-making, they claim that farm property has gone up from twenty-five to fifty per cent., and they add that it has reduced the cost of transportation forty per cent. France claims that good roads have developed the country and raised the price of property and improved the people. Good roads bring us into closer proximity with churches, school-houses, and halls where concerts and lectures may be heard and are thus a benefit. Good roads add to the pleasures of country life and better the condition of the farmers.

The Farmers as a Class are Ready for the Change.

In the early history of our country we find that the Indian trail answered a good purpose; but civilization in her onward march widened these trails into roadways of a rude kind it is true. These in turn were straightened, broadened, and levelled, and later on the Scriptural injunction was applied to them: "Cast up, cast up the highways; gather out the stones." Thus there has been a gradual improvement until within quite recent years we have come to a standsttill. The system belongs to the past, and the feeling is growing and rapidly gaining ground that we should make another step forward and improve the system. Let us then solve the problem by using our best efforts to insure a successful change. The experience of the countries of the old world where they have excellent roads should influence us in forming plans for a new system, and therefore I think it is only right and proper that we study their systems. I will therefore endeavour to give you a synopsis of some of the systems of the countries of Europe, and

draw from these and others some points of usefulness. There prevails among them roads kept up by the state. They in most cases have engineers or skilled workmen. They devote more time to maintaining their roads after having them made. They spend a large amount in making them properly at first.

France. The modern road system of France was inaugurated by the first Napoleon, and carried forward to its satisfactory conclusion by the late Emperor Napoleon III. Their road system has been of far greater benefit as a means of raising the value of lands and of putting the small landed proprietors in easy communication with their markets than have the railways, and have contributed largely to the material development and wealth of the country. They divide their roads into three classes: National or State roads, constructed and maintained by the state; department roads, entirely under the control and at the expense of the departments: township roads, which, though constructed by the communes, receive in most cases support either from the state or from the departments for their maintenance. The national roads radiating from Paris communicate with all the important cities and the departments in the country. They are placed under the jurisdiction of the department of roads and bridges, which is attached to the bureau of the Minister of Public Works. The second and third class of roads form a network of the country, and are under the supervision, in a general way, of the prefects and mayors. In making a new road the engineers go over the region, examine the direction the road is to take, draw up an exact estimate of the cost, make the specifications, and write out in detail for the benefit of the contractors their observations on the manner in which the road should be constructed. The work is then placed in the hands of the contractors, who must execute it under the supervision of the engineers and according to the stipulations of the estimate. All roads have perpetual attention; every rut or hole is repaired at once. No part of their road system is neglected. The tires of their waggons are generally from four to six inches wide, and so improve instead of injure their roads. The engineers are chosen by competition. The road men and superintendents are generally chosen from countrymen who understand this kind of work. They macadamize their roads.

Germany. There are in Saxony two kinds of roads: (1) state or government roads; (2) country or communication roads (connecting two or more towns or villages). The former are maintained at the cost of the state, while the latter are built and maintained by the city and country communities. The state roads are under the supervision of the Treasury Department: a special technical director for road building is attached to this department. There are in Saxony seventeen districts for the supervision of roads, and embrace two directors for each. The duties of the directors of these districts are to draw up the plans for and supervise the construction of the state roads. They are supplied, as the case may require, with a number of engineers and Government architects. Saxony is further divided into seventy-six road-master districts, so that from four to five road-masters stand under each district surveying director. These road officials must survey and conduct the works for road repair, and are entrusted with the control of all the road guards, 811 in number, who each have from three thousand to seven thousand yards of road to repair, clean and survey.

Italy. Roads are divided into national, provincial, and communal. The national roads are built and kept up by the government. These connect the chief cities of the kingdom with each other and with the seaports. Provincial roads are built and kept up by the provinces which may levy a tax by royal decree, or they may levy a per capita road tax. These roads connect the capitals of the different provinces, and the capitals with the nearest ports. Communal roads are built and kept up by funds from the communal revenues, or by a special tax levied by the communes. These three classes of roads are always macadamized.

England. 1st, the duty, maintenance, etc., of the highways is cast upon the ratepayers of the parish and managed by their highway surveyor; 2nd, parishes are united into districts, for the common object, under the supervision of the highway boards; 3rd, municipal boroughs and towns have powers conferred upon them to perform the duties of highway surveyors within their boundaries; 4th, the central authority, the Local Govern-

ment Board, London, is entrusted with a general superintendence of the several systems for the benefit of the nation at large. In order to raise the necessary funds for the maintenance of the highways the ratable property value in each parish is ascertained, according to the valuation list in such parish, or, if no valuation list be in force, by the justices of the peace, subject to appeal at the quarter sessions. The surveyor is to levy a rate upon all property rated. Mr. Telford says: "The most important element in the problem seems to be the employment of competent expert capacity to personally and immediately supervise the designing, locating, constructing, and maintaining of the highways of the various country-sides."

Canada. Our system of statute labor is well-known to every one, so that it will be necessary to add only the more recent legislation. In chap. 48, sec. 94, I find the following: "The council of any township may, by by-law, direct that a sum not exceeding $1.00 a day shall be paid as commutation of statute labor, for the whole or any part of such township, in which case the commutation tax shall be added in a separate column in the collector's roll, and shall be collected and accounted for like other taxes."

Chap. 42, sec. 534. "When a county council assumes by by-law, any road or bridge within a township as a county road or bridge, the council shall, with as little delay as reasonably may be, and at the expense of the county, cause the road to be planked, gravelled or macadamized, or the bridge to be built in a good and substantial manner."

From the foregoing and other systems I have endeavored to select those parts that I believe would meet the requirements of our country, and have kept in view two things, namely, the obtaining of good roads, and a due regard for economy. I will then submit for your consideration and criticism the following scheme:

Roads should be divided into three classes, (1) provincial; (2) county and (3) township roads.

Provincial Roads. These should be the principal roads leading to the largest cities and best shipping ports, and should be extended to meet the adjacent county roads. They ought to be, so to speak, the large arteries that would carry the surplus of the farm to the best shipping ports and best markets and and bring back the necessaries of the farmer. They should be built by the Provincial Government and kept in repair by the townships throughout which they run. They should be macadamized, the work to be done by skilled workmen under the direction and supervision of an engineer. Our Provincial Government has heretofore spent a large amount of money in our towns and cities, and comparatively speaking a small amount in our rural districts, so that the agriculturists of Ontario have a just right to demand such an expenditure. It would also enhance the value of our farms and better the farmer's condition. It would benefit the merchant, the manufacturer, the professional man, and in short all classes would directly or indirectly be benefited. Whatever improves the farmer's condition tends to improve the condition of all other classes. For it has been wisely said that "The farmer's gain is nobody's loss; but the farmer's loss is everybody's loss."

County Roads. These should be the principal roads leading to the county towns and best shipping stations, and would extend throughout the county in different directions and would, when possible, connect with the county roads in adjacent counties. These should be built by the county council but kept in repair by the townships through which they run. The reeves of the different townships would form the road board, and would have the roads macadamized under the direction and supervision of an engineer. A certain distance could be done each year and the stone hauled in the winter. This could be done by contract or a competent person with a number of assistants could be hired by the month to do the work as specified by the engineer.

Township Roads. These should be made and maintained by the township council. An engineer should be hired by the month, whose duty it would be to go over the township and draw up detailed specifications of what should be done. He would receive instructions from the township council how many days were required to be worked, and his specifications would just cover that number of days. He would also make observations

on the best way to do the work. Then a gang of men, say four men, and a foreman, would do the work specified. In larger townships, two or three such gangs would be required. In each case they should be under the supervision of the engineer, and each gang have a foreman. If five men could do the work specified by the engineer in two months, then have the township divided into five divisions or beats; if it required ten men then divide the township into ten beats, and if fifteen divide it into fifteen beats. These men should work in gangs during May and June, and each man for April, September and October would have his road beat, and with horse and cart, shovels, spades, etc., he would fill all ruts, keep ditches clean, thistles and weeds cut, culverts repaired, and keep the road in a general state of repair over his beat. Thus ten or fifteen would keep the whole township. Let me illustrate this by taking the township in which I live, Chinguacousy. There are 175 miles of road and we have to perform 4,250 days' road work. The engineer would go over the township and draw up detailed specifications and make observations on the best way of doing the work. Three gangs of men of five each, with foreman, would carry out in full the specifications of the engineer during May and June. By dividing the township into ten road beats, each of two gangs (ten men) would have 17½ miles to look after, and so the whole towhship would be kept repaired, and they would do this during April, September and October and be off work during July and August and could help the farmers in haying and harvest or work on the farm during the months of July and August when little teaming is done on the roads and when their services would be needed most on the farm.

Let us compare the cost of the two systems. Four thousand two hundred and fifty days commuted at $1 per day would be $4,250, not counting the path-masters' work, and there were 85 of them. As against—

10 men for 3 months, with horse, etc., $2 per day	$1,560 00
15 men for 2 months, with horse, etc., "	1,560 00
1 engineer for 2 months, at $65 per month	130 00
Average expense for carts, etc.	500 00
	$3,750 00

This would equal commutation at 88 cents per day. During April these men could be opening out and cleaning ditches and other necessary work, and in May and June could work in gangs carrying out the engineer's orders, and in July and August assist the farmers during the busiest season, then in September and October continue the repairing of the roads. Thus we have a stitch in time applied to ruts, we have the roads in the best condition for the fall teaming of grain, and we have the ditches and drains open for the fall and early winter rains. Oftentimes these same men could be engaged to haul gravel or stone during the winter season.

Engineer. This man is often an objectionable feature in this plan. Wherever a thoroughly practical engineer has been tried the results have been most satisfactory. The old Roman roads, a credit to the people of that age, were under the direction of engineers. France, Italy, Spain and most of the countries where roads are good have had engineers and to-day the same system prevails. In some of the states of the American Union where engineers have been tried they have the best roads. Our cities when they desire to make lasting roads always employ an engineer. In Hastings county we have the nearest approach to this system, and no county has better roads that I know of. So I conclude that the cheapest man in road-making is the engineer. And the more I study this question the more I am convinced that work done by means of an engineer is far the cheapest in the end. But he is expensive, and I think there might be put in his place a farmer or a farmer's son if he received a thorough training. I would therefore suggest that a five months' course on road-making be taught at the Ontario Agricultural College. It could extend from February to June inclusive, and a thorough course taken up and taught theoretically and practically. At the end of the term have an examination and

all who got certificates would be eligible for the position of what I have hitherto called engineer. This would also be less expensive than a regular engineer. The money to bear the expense of this system could be raised by commuting the statute labor or an equivalent to it raised by taxation, and could be made not to exceed $1 for a day if commuted nor less than fifty cents. This tax should be reduced a certain per cent. to all farmers who use 4 or 6-inch tires, and still more to those who have the hind tires' track just outside of the fore ones.

The engineer could be engaged by the township council as well as the other men. Some have thought that a county or township road board would be a good addition to this system. They could be elected for a period of three years, and have control of the roads and everything pertaining to the management of and expending the money. There could also be a bridge gang that would build all the bridges in the county.

Best Systems of Road-Making.

I will briefly outline the two best systems of road-making, the Telford and the Macadam and the Telford-Macadam.

The Telford System of Road-Making. The road-bed is built of large stones set up on edge and closely packed with small broken pieces. The layer covering this foundation should be composed of stones of less than two inches in diameter. This layer should be of the best stone as on it is the wear and tear of travel. Water should be thrown over this to make it bind, and then a large iron roller should be run over it to pack it down even and firm and bind to the foundation stones. Then a third layer of finer stones should be added and thoroughly rolled while wet as it packs much better.

Macadam System. This consists of the road-bed being built of 1½-inch angular stones, no large stones are used. All must pass through a 2-inch ring. They should be made wet before rolling and be of the best stone. This layer may be from 6 to 15 inches in depth. The surface layer should be of fine stone and thoroughly rolled while wet. In each of these roads the centre should be some four or five inches higher than the edges and gradually sloping towards them.

A Telford road 14 feet wide, 14 inches deep in the middle and ten inches at the sides cost $4,200 per mile. A Macadam road 14 feet wide, 8 inches deep in the middle and 4 inches at the edges cost $1,707 per mile.

Another Macadam road 14 feet wide, 12 inches in the middle and 9 at the edges cost $2,552 per mile.

It is generally believed that the Telford is the more expensive, but the difference is not great.

Telford-Macadam Road. This consists of a Telford foundation and a Macadam top. This makes an excellent road and very lasting. It is also estimated that either of these can be maintained at less than $10 a year after being once properly made. It is well to know that the maintaining of our roads now cost from $25 to $50 per mile. After being macadamized they would cost less than $10 to maintain them.

The meeting then adjourned until 1.30 p.m.

SECOND DAY—AFTERNOON SESSION.

Upon reassembling a discussion took place on Mr. Smith's paper.

Mr. Stuart, Middlesex: Would not this system bear too heavily on those living far from the cities?

Mr. Smith: I do not see that any scheme can be devised that will not have some inequality.

Mr. Hanley, Hastings: I do not think the system proposed would do in newly settled districts. The people there should be at liberty to commute or to do their statute

labor. Then, as to the Government taking charge of certain roads, I think they have now all they can attend to without increased taxation. I think it would be better to leave the matter in the hands of the counties and townships.

Mr. YOUNG, Cornwall: I do not think our farmers know exactly what a good road is, and it seems to me the province should maintain a leading road as a pattern of what a road should be. I do not see why the road that is used by everyone should not be subsidized as well as the road that is used by the few, that is the railroad. Another thing, many people think they are done with a road when they have built it, whereas the work is never done.

Mr. W. H. BROWN, Owen Sound: I heartily approve of what Mr. Smith has said with regard to training men for road-making in the Agricultural College. I do not, however, approve of subsidizing the roads by the general government.

Mr. STORY, Prince Edward: The gentlemen seem to lose sight of the fact that we have a statute already providing for the commutation of statute labor, and for the building of county and township roads.

Dr. COWAN: We know that there is legislation regarding county bridges, and we know the endless law suits that yearly take place settling which are county bridges and which belong to the municipality. I certainly think the Provincial Government would not be very apt to take up a system of provincial road-making. With regard to teaching the people of this country road-making, I think it is a very good suggestion, but road-making is already taught at the Ontario Agricultural College, and Professor Shaw has made the roads past the College a splendid example of what the roads should be.

Mr. GREGORY, Lincoln: The old system of statute labor is past its day. Many of you have heard of a machine that is being built in Hamilton for the purpose of turn-piking roads. A scheme was prepared in our township for the purchase of one of these machines, which cost $235; we asked the council to commute one-third of the statute labor at $1 a day. We did work on the different road divisions according to the number of days allotted to each: we hired teams at a cost of $8 a day. And I may say that operating this machine for fifty-eight days, at a cost of $500, we did more work in the township of Louth than ever was done by two thousand days of statute labor. I believe there should not be so many path-masters. There should be a township engineer who should have the superintendence of the whole township, and then with the use of proper implements, such as I speak of, we can do the same amount of work at one-third its present cost. I believe that if the statute labor was commuted at $1 a day, there would be sufficient funds to maintain our roads and bridges without dipping into the county treasury.

Mr. BEAM: The Ontario Government is building very good colonization roads in northern Ontario, where the settlers are too few to do this for themselves. I would suggest that part of the Ontario surplus claimed by the Government be used in the construction of roads east and west across the counties. Then there should be a frontage tax on the property. I have seen this system in use in Indiana with very satisfactory results. No one seems to object to this tax. Our manner of appointment of path-masters is wrong: men are often appointed who know nothing of the management of roads. In ten years we can gravel all the principal roads with the statute labor alone, if applied systematically. I have seen fourteen teams in a gravel pit with three fillers.

Mr. MADDEN, South Wellington: The statute labor is not only not systematically performed—it is not performed at all. Out of 4,000 days of statute labor in our township, 600 days would be the outside of the days performed. I would be very glad if this township was an exception, but it is not. I spoke on this matter four years ago, and I am very much pleased to see a change of sentiment since then. The only way I see out of the difficulty is to make the commutation of statute labor compulsory.

Mr. SISSONS: It is out of the question for the Government to deal with road-making. Whether the county shall do so is a subject that we shall have to consider in the near future. The county which I represent, Simcoe, has paid quite $1,000,000

in railway bonuses; in 1897 we will be through paying that. Then I think a better system should be adopted and more money spent on the roads. To make it compulsory, however, might not work well in some of the poorer municipalities.

The PRESIDENT: I have here a resolution moved by Dr. COWAN and seconded by Mr. KELLS, "That as we have now legislation regarding the commutation of statute labor, this Institute take no action in regard to further legislation until some township try the commutation plan and report against it, and that the thanks of this Institute be given to Mr. Smith for his valuable paper.

The PRESIDENT: I think Mr. Smith should have a few minutes to reply and then the motion will be in order.

Mr. SMITH: The first objection of any importance was to provincial roads. A committee would be appointed to locate these roads, and that would take away all the difficulty. The second objection is that the scheme is too elaborate. It is a much simpler thing to appoint ten or fifteen men and an engineer, than the 85 path-masters we have at present in our county. I do not think there should be new legislation. My idea was to lead to thought and discussion, and this will bring out a scheme that will meet the desires of the whole country.

The resolution was then put and carried.

A DEPUTATION DESIRED.

Moved by Mr. GOOD, seconded by Mr. KELLS, and resolved: "That in the opinion of this Institute it will be necessary that a deputation be appointed to wait on the Dominion Government to advocate the views of this Institute as expressed in the resolution passed so unanimously at its session of yesterday, respecting the removal of the customs duties on goods of British manufacture imported into Canada. We therefore ask our President and Executive Committee to appoint such a deputation to wait upon the Dominion Government at its earliest convenience."

The PRESIDENT: There is no necessity for any discussion, as this was done yesterday.

The resolution was then passed.

ADDRESS BY PROF. ROBERTSON.

Prof. JAS. W. ROBERTSON, Dominion Dairy Commissioner, then addressed the Institute as follows:

Mr. President and Gentlemen,—I am glad that my other engagements and duties permit me to attend this yearly gathering of the representatives of the Farmers' Institutes of Ontario. Most of us who come here have more expectation of being helped in our own calling and business than of giving what may become helpful to those whom we meet. However, in this as in other matters, the action and reaction are inseparable, and probably those who give the most help to the members of the Central Farmers' Institute will derive most benefit from its sessions.

BENEFITS OF FARMERS' INSTITUTES.

The ordinary labor of the farmer is apt to be of a monotonous and dreary character. Frequent gatherings such as this, help to lift up our occupation into more pleasant experiences as well as more profitable practices. Capacity for good management comes through knowledge, and ability to cope with difficulties is strengthened by conventions like the present. This meeting will fail to fulfil its best functions, if it shall result only in the

presentation and dissemination of information—no matter how good or apt that may be. To my mind, its best quality of usefulness lies in the opportunity and power which it possesses of affecting the courage, the attitude, and the spirit of the common people of Ontario. In rural communities good times put people in good spirits. I put the converse to you to-day and say that good spirits will almost, if not altogether, bring good times.

Let me mention, in passing, how pleased I am to recognize the vitality and growth of this Institute. It is commonly spoken of as "The Farmers' Organization of Ontario. It is to the credit of its officers and Executive Committee that the organization is alive and is continually adapting itself to the new needs of those whom it is designed to serve. Organization really implies the happy and best adjustment of certain means to attain a desired end. If all the organs in any organization do not work harmoniously, the sum total of achievement will be very much lessened. The apathy of some of the more distant organs of this Institute (I refer to some local institutes in some Sleepy Hollows in the Province) may cause such a condition of sluggishness in the spirit of the farmers in their district, that the most that can be said in their praise will be that they have attained unto a deathlike respectability.

The good clear thought of this Central Institute should be sent throbbing throughout every part of the agricultural community to the utmost ends of Ontario. On the other hand, the delegates from the several institutes should bring to this central gathering every year contributions of curiosity (and that is a quality in which our farmers are all too deficient), information, enthusiasm and hopefulness. By doing this for the Central Institute every farmer will give something to all the others without making himself any the poorer thereby. At the same time he will acquire from contact with the others, a large measure of these qualities of spirit and heart in his work which can be concreted in his own practice and realized upon in dollars and cents during the following years.

I do not desire to leave an impression upon your minds that the most possible outcome of this Institute can be stated in dollars and cents, or can be wholly concerned with the getting of them; but the little part I propose to take in its proceedings will have in view as the primary object the helping of you to realize more money from farming.

An Agricultural Revival.

An agricultural revival would not be a bad feature of our progress in the present day. I mean a real old-fashioned revival, such as when people met often in a spirit of most earnest and serious concern to discuss problems which were thrusting themselves upon their attention with irresistible intensity. To be a preacher in that revival, with the gift of stirring men's hearts in order to move them to right action, would indeed be a splendid opportunity for helping to call out the good and the God that is in all men. I use that phrase in a spirit of utmost reverence, because in all the manifestations of the Godhead in nature, we see a constant endeavor to put and keep all things in their correct relationship with each other. When a farmer acts in that same way he is manifesting and justifying the possession of his noblest birthright as a man. The application of this principle is not limited to putting soil and seed in their proper relationships to each other through the best methods of cultivation; to putting animals and food in the correct relationship to each other as to quantity, quality and quarters; it should extend also to adjusting the relationship of the finished products which the farmer has to dispose of, to the needs and demands of the markets which he can reach. It also implies the correct adjustment of himself to his business as a master and manager and not as a foolish enamored imitator.

When threatened with hard times, and much more so when they are at the door, it becomes men to be economical. By economy I have no reference to what is generally called "stinginess" or "meanness." The two are as wide apart as the poles. Economy is simply the wise administration of all the agencies and agents which a man can control. It implies the taking into his service of new agents if new work must be undertaken for which the old agents are inadequate. It implies the frequent examination of surrounding conditions, in order that the right agents and the best agencies may be selected. The

conditions which surround farmers in Ontario have become greatly changed within the last few years. It is commonly reported that these changes have been for the worse and not for the better, and in this, as in many other cases, frequent repetitions of half-truths sometimes give them, to the minds of the credulous hearers, all the validity of sound reality. These changes of conditions have not come by the will or doings of a few people. They are the outcome and achievement of all those forces which have been at work in the progress and consolidation of our English speaking civilization. Among these I might mention railways, telegraphs, telephones, newspapers, schoolhouses, etc. They have brought markets so close together that direct competition now exists between all the producers of any one class of products in all parts of the civilized world.

The general diffusion of knowledge, and the new wants which that knowledge has brought in its train, require food-products different from those which were formerly the staple diet of the people. World-wide competition and a demand for a better class of food on the part of all people should be reckoned as new conditions which the farmer must meet by an agriculture suited to them. It will no longer pay to keep selling the crude, bulky and primitive products of agriculture which average only meagre returns in money, and which tend to deplete the soil of the substances which are required to enable it to carry profitable crops. The production of the food products of concentrated quality and value, such as butter, cheese, pork beef, mutton, poultry and fruits affords scope for the exercise of intelligent labor with profit, and at the same time protects the land against exhaustion. It is a fortunate encouragement to those who are extending their operations in dairying, that the prices for dairy products have been maintained at fairly satisfactory figures during the year. The demand in Great Britain for Canadian cheese has been active and more favorably preferential towards Canadian products than ever The notable increases in the value of the shipments of cheese and butter (under which the prices and the demand have been sustained) indicate a trade which may be much further enlarged with advantage.

Canadian Farm Products in the British Markets.

A brief statement of some of the matters which came under my observation during my recent trip to Great Britain may have value in this connection towards helping the farmers to adapt their farm practices to the requirements of that market for food products.

I went over to investigate the newer preferences of the markets for butter and cheese ; and to these I added beef, bacon, poultry and eggs. As producers we must strive to meet the exact requirements of the consumers who are able and willing to pay the highest prices for our goods. We have no time to educate the tastes of the British public up to liking and buying the things which in our judgment they ought to prefer. Unless one happens to have a century or two of leisure it would not be worth while attempting the task of educating the tastes of the great consuming public. It is more expedient and profitable to cater for those tastes as they at present exist. The working classes in Great Britain, who are the large consumers of our Canadian food products, are both able and willing to pay for the exquisites and the delicacies in the foods which they buy. A while ago they had to content themselves with foods which sufficed only for the bare sustenance of life. Now they are fastidious in regard to both flavor and appearance in the foods which they select. They are also very conservative in regard to names, and have a strong British sentiment which leads them to pay 20, 25 and 50 per cent. more for the very same goods under the name of " Best English," than they are willing to pay, or are required to pay under the name of " Best Canadian." I could find but very few butcher shops where Canadian beef under its own name could be purchased. As one butcher said to me, " We keep only the ' Best English ;' Canadian and American beef can be found only in the rough shops where the cuts are cheap " I learned of one instance where a retail butcher was reported to have made a profit of a million dollars in five years from selling prime Canadian and American beef as the "Best English." Of course his customers were not wronged, because they got as good value in every pound which they purchased as could be got in a pound of beef ; but a very flagrant and very great injustice was inflicted upon the English and Canadian farmers.

In very many cases the crafty shopkeeper gets far too large a share of the price which the ultimate consumer pays for our own food products. We must devise a way of getting some of our Canadian products more directly before the consumers under their own name. I know what can be said in the matter of the enterprise of commerce, and the rest of it, being equal to the needs of economical distribution. But just here comes in the call for the exercise of that quality of which I have spoken—that of putting things in their correct relationship to each other. Here it is the putting of the Canadian producers right in their relationship to the ultimate consumers without the intervention of somebody who by some means gets more than a fair share of the consumers' money for the service which he renders.

When I spoke before this Institute last year I had occasion to remark that a considerable portion of Canadian cheese was utimately sold under the name of "Best English." I have to repeat at this Institute what I said then, with the added emphasis that a larger proportion of our cheese and other products than I then thought were sold as "Best English," are now being disposed of in that very way.

I think we will be able to use the mammoth cheese which we made at Perth, in Lanark county, to overcome part of that disadvantage under which we now lie. As some of you know, the mammoth cheese was made at one of our Experimental Dairy Stations for the purpose of forming the centre of our pyramid of Canadian dairy products at the World's Columbian Exhibition at Chicago. I have arranged for it afterwards to go to England, where it will be taken in hand by Mr. Thomas J. Lipton, the greatest of all retail provision merchants in the world. He has over 90 shops in London alone, and sells over 275 tons of tea per week. He will exhibit our mammoth Canadian cheese in every large city of commercial importance in Great Britain and Ireland. This will bring to the mind and attention of the public something new in reference to Canadian cheese, which may lead them to enquire from their grocer or provision merchant for a supply of it under its own name.

Others more competent than myself will doubtless treat of and deal with the question of the scheduling of our cattle by both Great Britain and the United States. It is useless to belittle the injurious aspect of this to the Canadian cattle trade. It is more foolish to magnify the effect into the form of a national calamity. Everybody knows that our cattle in Canada enjoy the most superb health. The dreaded disease of pleuropneumonia has not been and is not now to be found anywhere within our borders. In the meantime we must put up with the temporary loss, which comes from the misunderstanding and consequent unfair regulations of the authorities in these two countries. At the same time, this may be looked upon as an ill that is not all ill in its effects, if it induces the Canadian farmers to turn their attention towards feeding the cattle to a finish of fatness before they are sold or shipped from our own country. The compulsory aspect of this is the most distasteful to a high minded and independent people like our farmers. However, if it have the result to which I have just alluded, while it is an injury and an ill, it will not be without a measure of benefit in its train.

More Economical Feeding of Live Stock.

There are some matters in the home practice of the farmers which need more serious attention than the restrictions which these two governments have seen fit to impose upon our cattle. Let me ask the attention of the farmers of Ontario to the bulletin which I had the honor to issue on the feeding of steers last November. I shall be glad to mail a copy to every applicant who sends his name and address to the Central Experimental Farm, Ottawa. Farmers of Ontario should study economical methods of feeding in order that they may produce cattle at the least possible cost, because wasteful feeding will so increase the cost of production that no market within reach, under the most favorable circumstances, can leave a profit to the feeder. In conjunction with well-cured corn ensilage, 5 lb. per head per day of meal seems the maximum limit for the economical fattening of steers; and very little above that seems the maximum limit of meal per day for the economical feeding of milch cows. We carried on a very comprehensive test during the last two years at the Central Experimental Farm to discover if there were any

constant relation between the quality of the food which was given (in its content of meal or grain), and the quality of the milk which was yielded, in its richness or percentage of solids. We found that the addition of meal to the ration of cows after it reached from 5 to 7 lb. per head per day was not economical in point of either the quality or the quantity of the milk which they gave in return. We made something like 20,000 separate tests of the milk in order to have such a measure of data as would enable us to draw conclusions which would certainly not be erroneous or misleading.

From 5 to 7 lb. of meal per day seems a small allowance for a milking cow or a fattening steer, but if that amount can be saved to the farmers it would mean many millions of money per year to the cattlemen of Canada.

The Robertson Combination for Ensilage.

For some years I have been seeking to discover some substitute for the expensive and rich meals which have been fed with corn ensilage in order to make it a complete ration for fattening steers or feeding milking cows. At last I venture to think that I have been successful in discovering a substitute which is within easy reach of every farmer in Ontario, and almost every farmer in the Dominion who keeps cattle. I have here samples of ensilage made from Indian corn and horse-beans which have been grown together in the same rows. The sun flowers and horse-beans supply the albuminoids and fat in which the corn is deficient.

The method of growing is as follows: $\frac{1}{2}$ bushel of horse-beans are mixed with $\frac{1}{2}$ bushel of Indian corn; these are sown or planted in rows 3 or $3\frac{1}{2}$ feet apart on one acre. When the crop is grown the product from two acres of that mixture is put with the heads from $\frac{1}{2}$ acre of sunflowers (the Mammoth Russian sort). The albuminoids from the beans and sunflowers, thus provided in the ensilage, will be equal to $4\frac{1}{2}$ lb. of mixed cereals added to every feed of 50 lb. of ordinary corn ensilage. Besides, the albuminoids in the green and succulent state of these plants are likely to be more digestible than in the ripened grains.

The value of this to the farmers and cattle-keepers in Ontario is not quite evident at first sight. The advantages are as great as though a farmer could get nearly 40 bushels of mixed cereals per acre, in addition to his Indian corn crop, without the expenditure of any more labor or money than in the growing of the corn alone. The extra cost of growing $\frac{1}{2}$ an acre of sun flowers, and providing the seed for the horse-beans grown on the two acres in the rows with the corn, is equal to $15. Against that extra outlay the farmer gets from the $2\frac{1}{2}$ acres enough additional feed to be equal to 115 bushels of mixed wheat, barley and oats. That is equal to a clear gain in cash, (valuing the mixed grain at one cent per pound) of almost $14 per acre more than from the growing of Indian corn alone, and the growing of ripened grains to feed with it in order to make it a complete or well-balanced ration.

If a patron of a cheese factory or creamery in Ontario would grow three acres of this "Robertson Combination" for the feeding of cattle, it would be equal to a saving or gain to him, (as good as cash in the first year) of $41. Multiply that by the 50,000 patrons of cheese factories and creameries in Ontario, and you have a sum of $2,050,000.

That is not the only gain which would come to the hard-working farmers of Ontario from this new discovery. There would be a clear gain to the fertility of the soil equal to about 30 pounds of nitrogen per acre. When it is remembered that a ton of wheat takes from the soil annually about 40 lb. of nitrogen per acre, it will be apparent that the more the farmers grow beans with their corn and feed this combination, the better will they be able to grow all other grains without permanent exhaustion of the soil. I do not desire to press this aspect of the question very far at present, but this may be said by way of increasing your interest in this new crop for feeding. In all those commercial fertilizers of which nitrogen is a constituent part, the nitrogen is valued at at least 15 cents per pound. The clear gain in the nitrogen from the growth of the bean crop may be quite equal to $4.50 per acre. If this sum be multiplied by three acres for every patron of all the cheese factories and creameries in Ontario, and that be added to the direct cash gain from the growth and feeding of this crop, the sum will come to $2,725,000 per annum or more than $50 per patron annually.

The farmers of Ontario well know that no one who has been honored as their teacher in matters pertaining to their own practice is less visionary or more cautious in making statements for their guidance than myself; and I ask them to accept the information upon the new combination for ensilage, which I am able to offer them, with the assurance that it will more than justify all that I have predicted or claim for it. In order that it may become speedily, widely, and correctly known to the farmers of the province I want the names of 100 reliable and careful farmers who have silos, and who will grow a crop of this "Robertson Combination for Ensilage" during the coming year, under directions which I am willing to supply. The seed will be furnished at cost price; and of course there is no such thing as personal proprietory right in the combination. It is given to the farmers free, with the very best of good wishes that it may do for them more than I have ventured to state.

The Fattening of Swine.

On this subject I shall detain the Institute but a moment. Canadian fed and Canadian cured swine products are in very active and favorable demand in Great Britain. It will pay our farmers to rear and fatten more of this class of stock. According to the breed of the animals and the care which they receive, from 4 to 5 lb. of the coarse grains will yield 1 lb. of increase in the live weight of the swine. Canadian bacon and hams are almost equal in reputation to the Danish and Irish products. In view of the increased demand for live hogs in Canada, I hope our farmers will give this branch of their business a wide and rapid extension. As a rule it will pay them much better to sell their hogs alive than to butcher them at home and to sell them dressed. When sold alive they can reach the packing-houses in such a condition as to be capable of being dressed, cured and sent to England in a uniform and satisfactory condition. Great Britian imports about $40,000,000 worth of swine products annually. A much larger share of them should hereafter go from Canada.

Poultry and Eggs.

In the matter of poultry and eggs, Canadian farmers need as much awakening as they do in the matter of cows, butter, cheese and beef. Great Britian imports of these two articles of food to the value of $20,000,000 a year. I know there are difficulties in the way of reaching England with perishable products such as these, but they are not insuperable. I have information with regard to the egg trade which I think will be helpful in promoting it during the year, but I will not detain the Institute at present. Let me cite one instance of the capabilities of the trade in poultry. When in Liverpool in company with Mr. John Dyke, I examined a shipment of Canadian turkeys which had just arrived. There was a very active demand for them at 9 pence or 18 cents per lb. The birds arrived in splendid condition with the feathers on, and it was mentioned to me (and I hope it was true) that the shippers would net about $3,000 of profit on the venture. Between 18 cents per lb. and the price which the Canadian farmer has been getting for his turkeys, there is sufficient margin to leave a good profit for somebody; and and if the farmers would give their attention to this branch of their business, they would get a very much larger share of the ultimate price than 10 or 12 cents per lb. here. If some one could wave the magician's wand over the country, and multiply its wealth, I think he would do it through the cows and hens which have been thought the least valuable of our wealth creating agencies. If this meeting should result in the farmers giving clear thinking and energetic acting to these two branches of their business, it would result in the real acquisition of the wealth which the dreamer might suppose a magician only could create.

Butter Making.

As the subject of winter dairying is on the programme for discussion, I need not make but casual reference to it here.

The four winter butter-making stations in Ontario, which are being managed by the Dominion Dairy Commissioner this year, are being most heartily supported by the farmers in their vicinity. The supply of milk at them has been quite three times as much

as that of last year ; besides over a dozen of winter butter-making stations were started in different parts of the Province, as a direct outcome of the successful illustration of this business which was given by the Government last year.

The English butter merchants judges our butter as public men often estimate each other. He tastes the top and tastes at the sides of the package when *he buys* the butter ; that is, he judges it at its very worst points. When he offers *to sell* the butter, he bores down the centre of the package and shows it at its very best, to his expected customer. In order that the butter may be at its very best in all parts of the package, creamery men should use the best quality of grease-proof paper on the inside of the package. There is a very favorable attitude in the English markets towards our winter-made butter The dealers and consumers do not suspect us of any counterfeits or imitations. In that regard—as it should in all others—the name of "Canadian" stands for honesty and excellence. Of course a good many people who are faithless and unbelieving are continually saying,—"But if everybody goes into the business will it not soon play out?" Such logic is like that of a man who might say, "Strait is the gate and narrow is the way, and don't you think if I tried to get in I might crowd everybody else out?" In all these matters it takes intelligence and care to get money out of any branch of farming, but with those who exercise these and follow farming as a business, there is as much profit-making as in any other honorable calling.

I am glad to have had an opportunity of offering these few observations to this representative gathering of farmers, because I believe some of the information and thoughts will help on the emancipation of the men and women of Ontario into happier lives. The immediate good will not be the only good which will result from the putting of these new and better plans into practice. The further and better result will be the lifting up the farmer's life to a higher plane of activity, wherein he will find scope for the exercise of every manly faculty and power. The first gain to be realised may be the amelioration of his hardships in making money. The best and ultimate gain will be the lifting of his life intellectually, morally and spiritually through doing right, and putting things around him in their correct relationship to each other.

THE ERADICATION OF NOXIOUS WEEDS.

Professor SHAW, of the Ontario Agricultural College, then read the following paper : Weeds follow in the footsteps of man. While it is true that some weeds grow wild in a state of nature, it is also true that they are seldom found in this state in large numbers. Nor do they seem capable of spreading and taking complete possession of the soil as in cultivated areas. It follows, therefore, that while cultivation of a certain kind is necessary in order to completely destroy them, it is through cultivation of another kind that they are in a great measure enabled to spread. In other words, careless cultivation tends to increase noxious weed growth, while thorough cultivation may be made the principal means of destroying it. Weeds, like vices, seem to increase in numbers and variety with an increasing civilization. They are the great blot on the agriculture of the country at the present time. There are more weeds in the world to-day than a year ago, and there were more a year ago than one hundred years previously. The fact of the power of weeds to increase in cultivated areas, and the extent to which they do increase, should fill us with concern, if not indeed with alarm, insomuch that the farmers should unite as one man and make common cause in the destruction of this common foe. The strong arm of the law has been raised to prevent the multiplication of noxious weeds, but apparently it has been raised in vain. An Act was passed in 1887, and it has since been amended, "To Prevent the Spread of Noxious Weeds." This Act contains many wise provisions, but how far have they been utilized to prevent weed growth? It provides for the appointment of inspectors by the municipality, who are empowered, when there is a necessity for it, to enter fields where noxious weeds are about to go to seed, and cut them down ; but who ever saw one of those inspectors in any man's fields cutting down weeds? By another provision of this wise Act, "Any person who knowingly sells or offers for sale any grass, clover, or other seed, or any seed-grain among which there is seed of Canada

thistle, ox-eye daisy, wild oats, rag-weed, burdock or wild mustard, shall, for every such offence, upon conviction, be liable to a fine of not less than $5 or more than $20." The seeds of the Canada thistle, ox eye daisy, wild oats, rag-weed, burdock and wild mustard still continue to be sowed along with the seed of grains and grasses, and who ever heard of any person being fined for selling seed of this plant. It is the old story over again; the obtuseness and the indifference of public opinion, even on questions which relate to self-interest, are easily capable of defeating the ends of all legislation, however wise it may be. Before public sentiment can be properly guided in reference to this question, we must arouse slumbering energies by other means, as by the power of education. Educational forces are always mightier than legislative enactments; hence before the legislation which our Government has given us to prevent the multiplication of weeds can be even measurably operative we must educate our farmers as to the necessity of adopting measures with promptness and energy to free themselves from the presence of noxious weeds, and to protect themselves from noxious weed invasion in any of its baneful forms. The injury which our agriculture sustains from the presence of noxious weeds it would not be easy to estimate. They injure our crop by crowding, they rob them of food supplies, since weeds have more power to gather food than the cultivated plants amid which they grow. They increase the labor of harvesting, threshing and winnowing the grain, and they draw heavily upon the time and energies of the farmer in his efforts to hold them in check. If we would but make a careful estimate of the loss which we sustain as individuals and as a province, we could not fail to be astonished, it is so much greater than is generally supposed. From the Bureau of Industries for 1891, we learn that the crops grown that year were valued at $129,923,667. Now suppose that because of the presence of weeds in these crops the returns were put at five per cent. less than they would otherwise have been, what does it mean to the Province? It means that in 1891 the farmers of Ontario paid in tribute to weed prevalence no less than $6,838,088. If the returns were decreased by ten per cent. the loss to the farmers in their crop alone was $14,435,963. If they were fifteen per cent. less, the loss was $22,927,706. If twenty per cent. the loss ws $31,730,916; and if 25 per cent. it was no less than $43,307,889. Taking the mildest view imaginable of the loss we sustain through the presence of weed life, we cannot but conclude that in this matter we are annually offering a tremendous sacrifice on the altar of indifference. And this estimate does not take into account the cost of handling the weeds in the crop, the injury which they bring to machinery in reaping, and the extra labor of winnowing. But we pay tribute to weed domination in other ways. In 1891, 849,956 acres of winter wheat were grown. The estimate is probably within the mark which would claim that one-half of this area, namely 424,978 acres was grown on fallow land. The cost of fallowing this land would not be less than $8 per acre on the supposition that the work of man and team had been paid for at the market value for these, and that an allowance of $3 per acre as rental for the land were included, since it produced no crop that year. This expenditure, then, would be outlay for cleaning the land of weeds; and it would amount to no less than $3,399,824; add to this sum $6,838,088, which represents the five per cent. lack of increase in crop values as estimated above, and we have no less a sum than $10,237,912. This is a costly offering; it is a burthen we cannot well afford to bear. I appear before the representative farmers of this fair province to ask them to remove this burthen. It is costing us more each year than we get for all the cheese that we send across the Atlantic. And a great deal more than we get for all the cattle shipped to Britain every year. We are continually looking about us for extended markets, and yet we pay higher annual dues to weed extortion than any enlargement of markets can bring to us. We complain about cost of government, and yet we pay more two or three times over as the cost of weed life than would run the entire machinery of government. Men sometimes complain of the cost of the Ontario Agricultural College and Experimental Farm, and yet we pay a higher tribute to weed aggression and weed extortion every year than would suffice to run the aforementioned institution for nearly three hundred years upon the present basis of outlay. Every farmer in Ontario is laid under tribute to weeds to the extent of at least $50 a year, an outlay that would go a long long way toward securing a higher education for every farmer's son in the land. I am free to say to the farmers of this Province that we cannot afford to

bear this burden, nor should we think of bearing it. We would call a man a fool who continued to carry with him through life a heavy load which he might lay aside if he would only try to do so, by the use of means within his reach. What then should we think of men who carry this load of weed oppression with them through all the years of their farming life when they might get rid of it, at least measurably so, if they would but try. I ask the farmers of this Province on the ground of patriotism, to get rid of the presence of noxious weeds. I ask them for the sake of their toiling families to banish noxious weeds root and branch from within their borders. And I ask them on the ground of self respect to free their farms from the presence of the hateful weed blood suckers which are gorging themselves on the fountains of the farmers' prosperity. Don't say it can't be done, for that would be a monstrous doctrine which would assume that weeds were stronger than men.

The question, then, as to the possibility of destroying weeds is one of national importance. And it is just here that the great stumbling-block meets us in reference to weed eradication. There are apparently but few in our midst who seem to think it practicable to destroy noxious weeds completely. Prevailing opinion seems to have arrived at the conclusion that while it is possible to keep noxious weeds at bay, it is not possible to completely eradicate them. Because of this view, the effort is not made to clean them out root and branch, for we never find the practice of people in advance of their opinions. If I were asked the question, can noxious weeds be completely eradicated? I would unhesitatingly answer, Yes. If I were questioned as to the means, I would say that is too long a story to be told in full within the limits of this paper. I have written a book on this subject bearing the title, "Noxious Weeds and Modes of Destroying Them," which discusses at some length the methods of destroying the chief of the noxious weeds of this country. At one time, I am free to acknowledge, I accepted the view that noxious weeds could not be wholly destroyed without great labor. That view I have long since abandoned. I now regard it as one of the dangerous heresies which are hindering the progress of our agriculture. Noxious weeds can be completely destroyed, and more than that, they can be kept under at a much less outlay for labor than would be required to keep them but partially at bay. It should require no labored argument to demonstrate the correctness of this view, for, if we do no not admit its truth, then we are driven to the conclusion that the labor of subduing weeds decreases with their multiplication, which would be supremely absurd. But it may be well to mention here, that my contention has reference mainly to what may be termed noxious weeds. All weeds are not of this character. While no class of weed life is desirable, some kinds of weeds are so little harmful, that we need not give ourselves any serious concern in regard to them. A noxious weed is one that injures the crops amid which it grows, and that requires the adoption of specific modes in eradicating it. In reference to all weeds of this class, I am free to affirm that they can be more cheaply eradicated entirely than in part only in any process of agriculture that embraces a number of years.

Notwithstanding the possibility of completely destroying noxious weeds, and notwithstanding the desirability of effecting this end, it is extremely difficult to persuade the majority of our farmers that such an achievement is possible without great outlay. They seem to reason, in reference to the prevalence of weeds, that "The thing that has been is that which shall be," and that it will be with weeds as with the poor, they will always remain in the land. They will, indeed, so long as the belief prevails that they cannot be completely destroyed. We cannot expect any person to undertake in a whole hearted way what he believes cannot be accomplished, if, indeed, we can expect him to engage in it at all. The task of persuading all farmers that they can free their farms of all noxious weeds within a limited number of years, would probably be a greater one than the task of removing the weeds. And yet I have no doubt but that all Ontario could be practically freed from the presence of such weeds, if the farmers would all unite in using the remedies within their reach. The spectacle might then be witnessed of the cleanest country on this earth. In the meantime it would be looking for too much to expect that all men will adopt the necessary remedial measure in this war with weeds, or even a majority of them. But that need not hinder individuals from cleaning their own farms. It is not a sufficient objection to say that our farms will soon be smitten again

from those of our neighbor, though they were clean. Farms can only be smitten when this is allowed by the owners, and the logic would certainly seem plain and unanswerable which would lead us to believe that where farms can be made clean, they can with very much less labor be kept clean.

In freeing our farms of weeds it is greatly important that we understand some of the principles which relate to weed growth. And our knowledge of these need not be extensive or elaborate to render it very effective. Weeds may be classified as annuals, biennials and perennials. Annuals complete the cycle of their existence in a single year, biennials in two years, while perennials live from year to year. The two former can only be propagated by means of the seed. Perennials are of two classes, viz, simple perennials and creeping perennials. The former increase only through the medium of the seeds, and the latter through that of the seeds which they produce, and also by means of creeping root stocks which push out from the main stems and throw up fresh plants from time to time as they develop. In dealing with these various classes of weeds it is well to remember that when we have learned to deal effectively with one of them we have learned to deal effectively with all the varieties of that class, except in so far as their maturing at different stages may influence our modes of attacking them. For instance, when we have learned how to deal effectively with wild mustard, we have learned to deal effectively with all annuals in a general way: but we may have to modify our methods somewhat in dealing with them individually, since they ripen their seeds at different periods in the year. The same remarks will equally apply in fighting biennial and perennial weeds. We must also study carefully the way in which weeds are propagated. An accurate knowledge of this feature of the subject is invaluable to the weed fighter, but the limits of this paper forbid even the enumeration of these modes of propagation. It may be mentioned, however, that these are nearly all under our complete control, hence in this respect we are armed with a power which if rightly wielded, will in itself go far to give us victory in the conflict with weeds.

In fighting weeds, there are certain general principles which cannot be ignored by those whose efforts are to be crowned with victory. These principles cannot even be mentioned here in detail. To discuss them adequately would require more space than the limits suitable to a paper of this character would furnish. I may mention, however, that I regard the maintenance of cleanliness as one of the most important of these principles. In other words, when we set about the cleaning of our farms we must maintain the ground that we win by keeping it clean when we have once cleaned it. My contention is, that when we have once cleaned a one hundred acre farm, we can keep it clean at an annual outlay of not more than $25 per year, when the general cultivation is what would be termed average.

Then there are specific modes of fighting individual weeds, which cannot be given here, but which, nevertheless, are greatly important. To give this information in detail would be to write a volume, hence it would be unwise at this time, even to enter upon the discussion of so wide a question.

I greatly desire in drawing the consideration of this question to a close to lay stress upon four things, even at the risk of some repetition, each of which I consider of much importance. These are, 1. That it is possible and practicable to completely free our farms of the presence of noxious weeds. 2. That it is both possible and practicable to keep them so. 3. That both these ends can be attained without great outlay, when an intelligent knowledge of effective methods has been acquired, and 4. That it will pay farmers much better to keep their farms wholly free from noxious weeds than but partially free.

A MEMBER: We have been recommended to grow vetches for cattle feed. Do not they give trouble as weeds after?

Prof. SHAW: They may, if allowed to ripen; but when grown as cattle feed they are cut before the seeds are ripe.

A MEMBER: If the county councillors were compelled to appoint Inspectors would not that do something?

Prof. SHAW: It might, but I have not much faith in what legislation will do in this matter. I believe if the farmers can be persuaded to accept the truth, that they can destroy these weeds and that they will make more money when they have done so, we will accomplish a great deal more than we have by legislation. I would like the farmers of this province, if they have any weeds that are very troublesome, to send me the seeds. We want to grow them in special plots for the purpose of finding the means to destroy them.

A MEMBER: Can you not kill weeds by a bare summer fallow?

Prof. SHAW: You can; but summer fallowing, as I have told you, cannot be accomplished at a cost of less than $8 an acres. My contention is that you can clear a farm of weeds without that expense.

A MEMBER: What would you recommend for the ox-eye daisy and the milk weed?

Prof. SHAW: The ox-eye daisy is a simple perennial, it will live from year to year; it is very difficult to manage in pastures but I do not regard it as a difficult weed where we can cultivate the ground. I would not be afraid to undertake to obliterate it in two years by growing a hoed crop two years in succession, and then when the ground was seeded in the following year it would be necessary to go over the field with the spud lest there might be a plant coming up here and there. If you allow them to grow and mature their seeds for a number of years near where the parent plant grew, in time it becomes impossible to spud them. There is a real difficulty however, in getting rid of them in fields where you cannot use the plow. The only way in that case is to cut them year after year and after a time the plant will exhaust itself and die.

REPORT OF THE COMMITTEE ON NEW BUSINESS.

We, your committee, beg leave to report as follows:

1. Your committee has considered the paper on municipal taxation prepared by Colonel Grierson, and recommend that said paper be read and discussed by this Institute.

2. With reference to the resolution of Sheriff Hagar, recommending that Agricultural College bulletins be printed in French, your committee deem it inadvisable to recommend the passage of said resolution.

3. Regarding the resolution of Mr. M. Pettit regarding compensation to workmen, we recommend that the above mentioned subject be discussed by this Institute, the discussion to be led by Mr. M. Pettit.

4. With reference to the communication of Mr. King regarding the destruction of sheep by dogs, your committee declare its hearty approval of said communication and recommend the legislative committee to take action in the matter.

5. The resolutions of Messrs. Sheppard and McLean have been considered by us and referred to the committee on legislation.

All of which is respectfully submitted.

G. B. MOWBRAY, Chairman.

Moved and seconded that the Report be adopted.

Moved in amendment, and seconded, that the Report be read and considered clause by clause. Carried.

Clause 1 was read and adopted.

Clause 2, read.

Mr. MOWBRAY: Your committee considered that this was simply entering the wedge and the next thing would be a request from our French brethern that the Ontario statutes be printed in French. I move the adoption of the second clause.

Mr. CROSS: I move in amendment that clause 2 be not adopted but be referred back to the committee with instructions to amend it to read as follows: That the committee recommend that a small appropriation shall be set apart for the purpose of translating a portion of the agricultural literature of this Province into the French language. I do not wish to say much in the matter, although I feel very strongly. We are endeavoring to carry on our Institute under great obstacles. We have, as you are aware, a majority of French speaking citizens in our county and also in Glengarry and Russell, and we come here to this centre of English intelligence and Protestantism and ask you for that little boon of liberality and I do not think, if you take a second thought, you will refuse us. I can assure you that we did not come here with a demand on behalf of these Frenchmen

but simply with the interests of the Institute at heart—not on behalf of the French language, but only as brother farmers who deserve the greatest consideration on our part, and I feel that it is hardly fair on the part of men of my own blood and religion to stamp out this resolution at its inception.

Mr. WILSON: We might just as well ask for an appropriation for printing our statutes in German and Gaelic.

The amendment was lost and the clause (No. 2) adopted.

Clauses Nos. 3 and 4 were adopted.

Moved and seconded that the report in full be adopted. Carried.

TO SCHEDULE UNITED STATES SWINE.

Moved by Wm. KEITH, seconded by Jas. DICKSON, "That the Government be petitioned to schedule United States swine, on account of the prevalence of contagious disease in that country." Carried.

BINDER TWINE AT THE CENTRAL PRISON

Moved by Mr. THOS. A. GOOD, seconded by Mr. ALFRED SMITH, "That this Institute views with pleasure the fact that the farmers of Ontario have taken into their own hands, with the assistance of the Ontario Government, which is manufacturing binder twine at the Central Prison, the breaking up of the combines and monopolies which we have had to contend against for the last few years, and established in the city of Brantford, an anti-monopoly binder twine and agricultural implement manufactory owned and controlled almost exclusively by farmers and for farmers; we therefore as representatives of the farmers of Ontario, recommend this establishment to the people of the country and ask them in their own interests and in the interests of the whole country to support this enterprise both with their sympathy and patronage, and by so doing show the monopolists that we are determined not to allow our hard earned money to go into the pockets of the few at the expense of the many." Carried.

Moved by JAMES MCEWING, seconded by GEORGE MOWBRAY, "That whereas the farmers of Canada during the last thirteen years have largely supported a protective policy for the purpose of establishing and building up the manufacturing interests of this country, and whereas such manufacturing industries as are suitable for this country have received such assistance for a period long enough to enable them now to withstand fair and open competition; and whereas the Canadian Manufacturers' Association at its annual meeting held in Toronto February 7th, declared and reaffirmed its determination to support and perpetuate the high tariff policy; be it therefore resolved that this meeting hereby declares and affirms that to continue and perpetuate such high tariff policy will be detrimental to the vital interests of the agricultural community That we are of opinion that the time has come for the adoption of free trade with Britain and the same privilege to foreign countries that will give a like privilege to us."

After a short discussion the debate on this resolution was adjourned.

At 6.30 the meeting adjourned for one hour.

SECOND DAY.—EVENING SESSION.

The President occupied the chair when the Institute resumed business.

THE TEACHING OF SCIENTIFIC AGRICULTURE.

Mr. T. G. Raynor, Rosehall, read the following paper :

"Resolved, that in the opinion of the members of the Central Farmers' Institute the question of Scientific Agriculture should be one of the branches upon which all candidates for certificates to qualify them as teachers for our public schools should be compulsory, and that no candidate who cannot successfully pass a satisfactory examination in Agricultural Chemistry should be granted a certificate to teach the youths in the rural section of this Province."

That the subject I am to introduce to you is an important one must be clear to the mind of every one present. I feel my inability to deal with the question as it deserves, yet I trust the discussion that will follow may be profitable.

I labor under the disadvantage of presenting nothing new, in that the ground has been pretty thoroughly covered by very able educationists, as Mr. J. E. Bryant, M. A., in an address delivered before the members of the Ontario Teachers Association a year or so ago, which was published and sent broadcast over the province, and by Mr. C. C. James, M. A., Deputy Minister of Agriculture, in a recent address delivered before the Provincial School Trustees' Association, and also published in bulletin form. I am indebted, however, to these gentlemen for much of my information on this subject, and the fact that most of you are already acquainted with the theme will be a cause for quicker action.

The subject of scientific agriculture as a study had its birth in the early part of the present century. Although so late in coming to the front as a science, it has made rapid progress, and now some of the best minds the world has produced are engaged in unravelling one or more of its many sided issues. In all the progressive portions of the European continent much attention is paid to agriculture by way of teaching its principles, and experimenting. Nearly every province, if not all, in the German Empire, some of which are not half the territorial extent of Ontario, have in many instances several Agricultural Colleges and Stations. France, Italy, Austria, Spain, Portugal, Great Britain, and the United States, spend large amounts of money annually for agricul-cultural education. In these older countries the yield of grain per acre was diminishing year by year to an alarming extent, but now by applying some of the principles of agritural science the yield per acre has been restored to its original standard, and in some instances has been even exceeded. For example, the average yield of wheat per acre in England in 1845 was 13 bushels, while with rotation in cropping, the use of special fertilizers, etc., the average yield in 1885 was 31.24 bushels. In France thirty years ago the average wheat yield was 22 bushels per acre, while now 33 bushels is considered only a good yield, and on the best soils 43.48 and even 55 bushels are constantly expected and frequently obtained. Even 60 to 80 bushels have been returned in Northern France. Is there not an argument just here in favor of a better system of agricultural education than now exists in Ontario? All must agree that the day has gone by when the farmer "by tickling the soil with a hoe can make it laugh into a bountiful harvest." Not many years ago our wheat yield averaged from 35 to 50 bushels per acre. Where is the average now? down, in round numbers to 18 bushels per acre.

While our system of public school education is considered by prominent educationists of many lands a model of perfection, what is there in it after all to give children of the rural schools a knowledge of the occupation which most of them intend to make their life-calling? I submit very little. Not nearly so much as might be given with the same machinery. A question which has often been raised and as frequently answered in one way or another is, how shall we keep our boys and girls on the farm? For no sooner do they give signs of some promise as students, than, with the consent of the parents, the teacher, whose reputation usually depends on the number of pupils he passes, bends every energy to prepare them for the entrance examination. That goal reached, they are then pushed along in order to pass a second examination, either for a teacher's certificate, or

for entrance to college that they may fit themselves to join the ranks of one of the already crowded professions. There is no desire now to go back to the old farm. That work is for the failures and drones in the educational race. The whole tendency of our present system is to allure from the farm rather than to it. Of late something has been done to offset this tendency to leave the farm through the way indicated.

I. What has been proposed? (1) It has been proposed that some of the already numerous high schools be converted into agricultural high schools, as steps to the only Agricultural College in the Dominion, at Guelph. (2) That a course of study of the agricultural sciences be opened in each of our high schools to bring such instruction within the reach of all. (3) That an Agricultural College be opened in the vicinity of Kingston to better accommodate the eastern portion of the Province, and (4) that a summer course be instituted at the Ontario Agricultural College for the benefit of teachers to qualify themselves for the work in the elementary schools. Now, it is not my intention to discuss all, or any one of these schemes, no matter how feasible they may be, and I think good work could be done in the ways indicated; but I will here state what I consider should be done in order to give the best and quickest results, *i. e.*, have it made compulsory that teachers of rural schools be qualified to teach scientific agriculture, by having studied and passed satisfactory examinations in the same before being granted their certificates.

II. What has been done? (1) Our Ontario Agricultural College. (2) A course of agricultural instruction is given at the Normal Schools by which a few obtain some of its principles but as you know, the great mass of our rural school teachers are those who hold third class certificates, and who have received a three and one-half months' training at our Model Schools. Usually these teachers make teaching a stepping stone to some other line of business, and these are constantly dropping out of the profession. (3) An admirable little text-book has been prepared by President Mills and Prof. Shaw of the Agricultural College, and the subject of agriculture is made optional with the subject of Temperance in our schools: and what is the result? I do not know of a single school where agriculture is taught, but almost invariably temperance is chosen, it being easier for the teacher to grasp and teach. Although a very important subject, and I would not be guilty of underrating it, yet I believe the subject of agriculture is of equal importance. In fact there are few points for comparison, unless they were compared as subjects to form a part of elementary education. On this point the subject of agriculture has been ably argued by Mr. Bryant in his valuable address, that it is a perfect subject, having a threefold character in that it is (1), disciplinary (2) æsthetical and (3) practical or utilitarian. It answers these three sides in the educational process much better than many of the subjects already on the public school curriculum.

If what I have said be true, why then, you ask me, has not the study of agriculture been made compulsory ere this, and are there sufficient reasons for taking any steps in this direction now? In answering the first part of the question, I would say, that it is during the last few years only that there has been any need of it felt, and consequently nothing has been asked at the hands of the government. In answer to the second part, I think you will agree with me that the time is now ripe for taking some action in the matter. If you refer to the recent bulletin written by Mr. James, you will see this part discussed in the answer he gives to the questions he asks, viz:

1. Should agriculture be taught in our public schools?
2. Can agriculture be taught in our public schools?
3. How can agriculture be taught in our public schools?

I shall make some reference to these answers: He remarks in dealing with the first question, "Should agriculture be taught in our public schools? It should, because of the number of people engaged in and dependent upon it. Two-thirds of the people of Canada are either residing in the country and obtaining their living directly from the soil, or are so intimately associated with the rural districts (living in small villages) that they may be termed rural. Sixty per cent. of the assessed population reside in the townships, and 69 per cent. of the public school population belong to the rural districts, as will be seen

from the following statements": He proceeds to prove his condition by reliable statistics, and points out a deplorable fact, that although we are such a young country, our urban population is being increased at the expense of our rural population, which decreased from 86.7 per cent. in 1881, to 81.0 per cent in 1891, or a change of 5.7 per cent. in ten years. There is a similar tendency to centralization in all old countries to a greater or less extent. Another reason he gives is, "instruction in agriculture should be given because of the large amount of capital invested in it, the wealth annually produced by it, and the large share it contributes to our trade and commerce." In explanation of which, I cannot do better than quote some of his own words. After giving some statistics with regard to the amount of capital invested in manufacturing industries on the one hand, and agriculture and its products on the other, he says, "Reference has sometimes been made to the statement that the output of the manufactures of Canada equals the total produce of our agriculture, and, therefore, the inference is drawn that our manufactures are as important as our agriculture; but a careful consideration will show that the inference is not fairly drawn. The total product of our manufactures represents the same raw material counted in twice, three times, and in some cases four times, and in many cases the product of the agriculturist is the raw material of the manufacturer. The farmer produces, say $1,000 worth of wheat, which the miller turns into $1,200 worth of flour, and the baker into $1,400 worth of bread. The farmer has added to the wealth of the country almost the entire $1,000; whereas, the miller and baker combined have added, not $2,600, but only $400. If we compared total products, we would compare the $1,000 worth of wheat with the $2,600 worth of flour and bread. The wool which the farmer produces reappears in the product of the woollen mill, the tweed manufactory and the tailor shop; the load of oak logs may go through the saw-mill, the planing mill, the cabinet shop; the load of bass wood may go through the paper mill and the printing establishment. Taking the value of the raw materials from the total product, we find the following to be the amounts of wealth added yearly: By the manufactures of Canada, $220,000,000; by the manufactures of Ontario, $110,000,000; by the agriculture of Ontario, $180,000,000. That agriculture is not so remunerative as it should be, in comparison with other work, is seen at once from the fact that while there is nearly six times as much capital invested in it as in manufactures in Ontario, and it pays double the wages, it does not add to the wealth of the province double that added by the manufactures. Some might say that the profits of agriculture are not large enough."

After giving a detailed statement with regard to the surplus wheat of Canada he observes that "It is asserted by many that Ontario produces her 27,000,000 bushels of wheat at a loss, when wheat sells at less than $1 per bushel. If so, the remedy is to increase the yield per acre, or to decrease the acreage. Every bushel per acre of increase would mean a total increase of 1,500,000 bushels. This surely is worth striving for, and the way to obtain success lies as follows: Improvement of the land by drainage and thorough cultivation, cleaning from weeds, increased fertilizing, and improved varieties of seed. Instruction in the various branches should help on the good cause."

Mr. Bryant, in dealing with the same point, compares agriculture with the other principal industries of the country, viz., lumbering, the fisheries, mining, manufacturing, and mercantile pursuits, and gives satisfactory reasons why it would be impracticable to give special instruction in the different branches mentioned, and what great advantages would arise from instruction in agriculture, because of the numbers engaged in it and the amount of capital invested. At the same time he points out what lines of instruction might with advantage be given, as, a knowledge of the soil, plant life, tillage and drainage, crops, rotation of crops, the breeding, care, and management of live stock, and dairying, including cheese and butter-making. I will not enlarge upon this further than to state that the first principles of natural science are easy to be understood, and therefore are easy to teach.

In answer to the second question Mr. James asks, "Can agriculture be taught in our public schools?" His answer is, "What has been done can be done," and again allow me to quote from his bulletin: "The various progressive countries of Europe are endeavoring to answer this question, each undertaking it according to the conditions of the people.

and the peculiarities of their situation. To France, however, we may turn as the most progressive and advanced of all civilized countries in the matter of agricultural education. France has a population of 38,095,156; her farms are the best cultivated in Europe, and her produce per head has increased by one half in the past quarter of a century. 'The capital represented by agriculture is at present double what it was in the year 1815, and nearly 40 per cent. of the wealth of the nation.' (Mulhall.) The Budget of the Minister of Agriculture for 1891-2 provided $850,000 for special agricultural instruction in institutions devoted to agriculture alone. First there is at Paris the Institut Agronomique, the Agricultural University, famous the world over for its investigations; then comthree National Schools of Agriculture, one of Horticulture, one of Dairying, three of Veterinary science, two of Forestry, and two Shepherds' schools. To the above $481,000 was granted. In addition a professor of agriculture for each of the 86 Departments of France, Farm schools, Apprentice schools, Experimental stations, Fields and Colonies, and Agricultural orphanages, are subsidized to the extent of $369,000.

"In 1850 agriculture was made optional in public schools, and until 1879 instruction was largely dependent upon the encouragement of agricultural societies and private benefactors. In 1879, however, a law was passed compelling every Normal college within six years to provide agricultural instruction for the teachers in training, and further requiring the primary schools within three years thereafter to make agriculture a compulsory subject in their course of instruction.

"The introduction of agriculture, therefore, began with the training of the teachers—a step certainly worthy of imitation. The instruction in that subject is given by the professors of agriculture, one of whom is placed by the Government over each of the 86 Departments of France. Their salaries are paid one-half by the Minister of Education and one-half by the Minister of Agriculture. Their duties are three-fold, to give instruction to the teachers-in training, to hold conferences with the farmers, and to carry out any investigations suggested by the Government. Gardens are attached to these Normal schools.

"Many of the schools have small gardens attached, and have agricultural museums. The teacher is encouraged in many departments by prizes offered by the agricultural societies, and the work is supplemented by visits to first-class farms, dairies and establishments where agricultural products are being handled.

"The teaching of Agriculture in the superior primary schools is of a more advanced nature, and is more frequently met with. Prof. Teegan thus refers to it: 'The course extends over two years. It includes for boys practical ideas of vegetation, the different means of reproduction, the nature of different soils, manures, the principal agricultural machines, planting, transplanting, irrigation, the principal kinds of cultivation followed in France, and principally the agricultural productions of the district in which the school is situated; diseases of plants and their prevention; weeds, vegetables, fruits, flowers, greenhouses, the cultivation of fruit trees; domestic animals; book-keeping, etc. The agricultural instruction is based on this general programme, but varied and extended to suit the needs of the locality. The practical illustrations are to be given in the school gardens and experimental fields, and during visits paid to the farms of the surrounding districts. In some of these institutions there is a special agricultural section, under the charge of a special professor. The number of such schools is, however, small.'

"The conclusions arrived at from a study of the above works, also the Reports of the British Board of Agriculture, 1891, are—(1) France has found it advisable to supplement the work of her agricultural colleges by introducing agriculture as a special study into her general school system. 2. The work has been begun by training the teachers first, and while general methods have been prescribed the system is sufficiently elastic to meet the varying abilities of teachers and pupils. 3. The work is as yet in only the first stage of development, and although all the rural children of France have not been reached and the end aimed at has not yet been attained, the success achieved is very encouraging, and worthy of imitation by other nations."

Allow me to add a few words as to what is being done in Italy. "Agricultural education in Italy is at present mainly under the direction of the Minister of Agriculture, but partly under that of the Minister of Instruction. It is distributed in the fol-

lowing schools—(1) High schools of Agriculture; (2) Special agricultural schools, and sections of agriculture and survey in technical institutes; (3) Practical schools of agriculture; (4) Courses of rural economy and agriculture in universities; (5) Special short courses given at experiment stations; (6) Itinerant chairs of agriculture and of viticulture; (7) Courses of agriculture in normal and technical schools; (8) Agricultural instruction in elementary schools; (9) Private schools of agriculture. Besides these regular schools and courses of instruction on subjects of special interest is given every year in different districts of the Kingdom."

Each State in the American Union has its agricultural and mechanical college and experimental station or means provided for one. In our own country we have a number of experimental stations, but only one agricultural college, which is meeting with signal success now that its objects and aims are better known to the farmers through the Farmers' Institute meetings. Mr. James, in referring to it, says that "the Agricultural College at Guelph teaches nothing but agriculture and the subjects connected with agriculture, and this year it is filled to the utmost capacity. Provision has been further made for an additional short course in dairying during 1892, and the applications are greatly in excess of the accommodation. But although we have surpassed any other countries in this work, 110 or 115 students in agriculture are too few to come annually from the 70,000 youths, 15 to 21 years, who are living in the rural parts. Agricultural instruction in the public schools might very materially increase the number of those who are desirous of thorough agricultural instruction."

The third question is, How can agriculture be taught in our public schools? Here again the answer is so well put that I cannot do better than quote some more of Mr. James' own words rather than have it said that my thoughts were all borrowed. He says by way of general remarks that "All, or nearly all, depends upon the teacher. To one interested in the progress of agriculture, informed upon the principles of the sciences involved, acquainted with rational methods of teaching, and fully determined to impart agricultural instruction, the entire difficulty is easily settled. But in the case of teachers who have been brought up in cities and towns, who are unacquainted with agricultural work, who have no bias towards agriculture, and who may be merely making the teaching a convenience for a couple of years whereby to earn a little money, the difficulty may be well nigh insurmountable, and there is absolute necessity that some training and direction be given before the work is undertaken, otherwise it were better to leave it alone entirely." I would say, however, with reference to the qualification of the teacher, that by making it compulsory that teachers shall qualify themselves to teach agriculture, I have the conviction that it will ensure in the quickest and most effectual way the teaching of agriculture in our rural schools. If we, as farmers, can agree, unanimously agree, that great advantages would arise from such a course, we would get what we asked for. I am not so blind that I cannot see many difficulties in the way of already qualified teachers becoming possessed with agricultural knowledge to teach it; yet as many will teach only a year or two, and those who are making it a life profession may with a little patient study and investigation become efficient teachers, much of the seeming difficulty may be overcome. And if, as Mr. James says, trustees would insist that agriculture be taught and there were some encouragement given by way of bonus, no doubt any such obstacle would be wholly overcome. Mr. James further states that "Trustees desiring agriculture to be taught in their schools must insist upon its being taught, must be willing to assist in providing whatever means may be necessary. It may even be found advisable to grant a bonus to teachers who are competent to give instructions in this branch, especially if they have to incur increased expense in fitting themselves for such work. Charts may be required, some agricultural paper may be found helpful, but the entire outlay need not be very large. Too much should not be attempted at first. The work should be introduced gradually, and the understanding at the outset should be very definite that by teaching agriculture in the public schools it is not intended to teach how to plow, how to harvest, or how to feed stock, but rather the why and the wherefore, and to arouse an interest in agricultural operations. The principal aim and object of instruction in our public schools should be the creation of a sentiment in favor of agricultural work, the

gradual development of a love for the country and its healthful life, the arousing of a noble ambition in the young minds to become progressive and successful agriculturists, the spreading abroad of the idea that the industrious, thoughtful, honest farmer is the most valuable citizen of this Canada of ours—a man to be respected, appreciated and honored by every member of the community."

I am in accord with his subsequent remarks when he says: "Thus there are two sides to agricultural education. In addition to imparting knowledge or teaching the student how to observe and how to think, there should be a cultivation of the feeling, the sentiment. Who can tell what results unforseen might flow from attending to a few improvements in the surroundings. Let the trustees put a neat fence about the little school yard, hang a simple but attractive gate, drain the play ground, level it, sod or sow to grass, erect outbuildings at least suggestive of humanity, brighten up the interior of the school room with fresh paint. Then let them provide the schools with a few dollars to procure some neat charts and pictures dealing with rural life. In one corner have a cupboard to be filled with books and reports upon agriculture: fit up a couple of glass museum cases.

"Now let the teachers encourage the pupils in the setting out of native shrubs and trees about the grounds and the growing of a few plants inside and outside. Let the teachers and pupils make a collection of the weeds, the wild flowers, the grasses, the grains, the soils and rocks, and the insects injurious and non-injurious of the section and arrange them in the cases. If possible, let them secure a few large views of the best farms and farm buildings and farm stock; and the Agricultural College, and hang them upon the walls. Thus one addition would suggest another, and the dull, dreary, repulsive surroundings of many rural public schools might be changed to bright, cheery attractions that would bind together inseparably the two conceptions—rural life and pleasure. It may be that the condition of the rural school has been the repelling force to send many a boy to the town and city, and may we not expect that the improvement of surroundings would have some effect in binding the young men to the life and work of the country!"

No doubt very much could be done as he suggests by giving an agricultural turn to many of the subjects already taught, as reading, arithmetic, drawing, English and Canadian history and composition. Indeed this could be most satisfactorily accomplished if the teacher be trained in that way.

COMPULSORY AGRICULTURAL EDUCATION IN RURAL SCHOOLS.

Mr. Lawrence, Collingwood, read the following paper: "Should agricultural education be made compulsory, and if so what will be the results?"

In the first place let us enquire what agricultural education is. Agriculture is the art of cultivating the soil in order to make a given portion of land produce useful vegetation, of the largest quantity, of the best quality, with the least possible expense. Education is acquiring a knowledge of the sphere or business which the individual intends to pursue. Those engaged in agriculture are called farmers. It is a well-known fact, that the very existence of the animal creation depends upon the products of the soil. Before entering fully into this subject, let us compare agriculture with the other leading industries, such as lumbering, mining, fishing, merchandise and the learned professions. Let those engaged in the arts and professions exchange their lumber, minerals, etc., for lawyers' opinions, doctors' prescriptions, clergymen's sermons, etc., and see how long their business would exist. In less than one week their very existence would be near a close; but then, on the other hand, let them exchange with the farmers for the products of the soil, and then everything will go on satisfactorily.

Next let us enquire if there is a sufficient number engaged in agriculture to demand that agricultural education should be made compulsory in rural school sections. According to the statistics of the country there are more than twice as many engaged in agriculture as there are in all the other trades and professions combined. Then, again, from the same source we find there is twice as much money invested in agriculture as

there is in all the other arts and professions. The same may be said about the taxes that are paid by the different occupations.

Now, it has been shown that agriculture is of more importance than all the other arts and professions together twice over. Therefore to say that our farmers should be allowed to grope along in ignorance without any education except what they can pick up by chance, is most irrational. The only reason that most farmers can give for doing any kind of work is because their fathers did it and their grandfathers did it, or they saw their neighbor Jones do it. Now, this is not as it should be. What would you say about a lawyer, doctor or preacher if he should practice without being educated in his profession? You would say that he was a fraud and a humbug, that he should be arrested and perhaps put in prison. Now, since agriculture is of such vital importance, and farmers as a rule are fairly successful without any technical education, what would be the results if they were all well trained in their business, and able to tell what crops different soils are adapted to produce, and when these crops are grown, what effect they would have when fed to different animals, also how to cultivate and manure the soil for different kinds of crops, the effect of draining, etc., the principles of breeding and feeding stock, and how to turn their products to the best results? These, and many kindred subjects, should be taught to our boys while in school. But, you will say, the farmers have a college in Guelph. Very true, but would it not look very foolish to send a boy to college to learn his A B C's? Then again, how many avail themselves of the Guelph College? I do not think one in a thousand. What is the reason? Because it is too expensive for the majority of farmers to send their sons to college to learn the first principles of agriculture. Others, again, will say the farmers have the same chance for education as the professions. I say no, because as soon as our boys leave the common school and go to the high school the whole tendency of that education is to draw him away from the farm. How different it would be if the first principles of agriculture were taught in the rural schools of the country, and after that prepare them in the high schools for the college? Then instead of only having one college we would require as many colleges as all the professions put together, and still more would be required; and that they should give our young farmers certificates the same as school teachers and allow no man to oversee farm laborers without a certificate.

With this improved system of education what would be the results? Farmers at once would start to be more prosperous, mortgages would disappear, farms that are now worth from $30 to $40 per acre would go up to $100 and perhaps $200 per acre. Farmers would be sent to Parliament instead of professional men, our laws would be amended so that we would not be governed, as at present, almost to death. It is admitted that there is no better country than Ontario under the sun, and if we are fairly successful with little or no education, and that it takes professionals all their time with all their learning to make ends meet, showing the weakness of their case in comparison to agriculture, with this system of education in full operation people of other countries would come over to see our greatness, and then they would say, with the Queen of Sheba, "The half was not told us."

On motion the discussion of this paper was adjourned till the following day.

ADDRESS BY HON. JOHN DRYDEN.

Hon. JOHN DRYDEN, Minister of Agriculture for Ontario, was introduced, and spoke as follows:

I am pleased, indeed, to find here present so large a number of the representatives of the various Farmers' Institutes of the province. I should be glad to appear among you as one of yourselves, but, unfortunately, I am not a delegate from any of the institutes, and, indeed, I do not know that I can claim to be a member of any particular institute. I apprehend, however, that I occupy a relationship which is better and stronger than either of these. I have assumed, if you will allow me to so put it, the relationship of a sort of godfather of all the institutes, taking a general interest in each one.

You are all aware of my efforts during the past two years to increase the membership and to infuse new life, energy and vigor into the various gatherings connected with our Institute. Judging from the last series of meeting which have been held during the past six weeks, I am free to say that the efforts have been crowned with success. With a few exceptions, the meetings all over the province have been larger and more enthusiastic than ever before. These meetings have cost the province about $8,200 during the last year, and whether good value has been received for this expenditure depends largely upon the use that will be made of the information provided. However, I make no apology for spending this paltry sum on so important a work, because it is clearly in the interest of the foundation industry of this province.

Our province was first settled by our fathers, who were the pioneer farmers, and who converted the dense forests originally found here into the fertile fields now owned by us, their successors. Whatever progress has so far been made in the province, has been largely due to the development of agriculture; whatever wealth may have accumulated here, has been for the most part taken from the soil, either in cereals or in timber. We have made considerable advancement in agriculture during these years, but I want to point out to you that we have only commenced development along many of the lines connected with this industry. Before you can have successful development in agriculture, indifference and inactivity must give place to energy and enthusiasm. Give me a neighborhood of wide-awake and energetic farmers, and I will guarantee constant development in that section.

Undoubtedly, we are passing through days of depression in agriculture. Every man of us feels greatly the loss of markets for some of our products, and the extremely low prices to be obtained for others, and yet I assert, in spite of this fact, that there never was in the history of this province greater enthusiasm and more resolute determination to fight their way through the present difficulties than exists to-day among the farmers of Ontario. Hundreds all over the country have decided that old associations must be severed, that old methods must be abandoned, and they are eager—hungry as some express it—for information which will be helpful to them in this their time of need. This information, I hold to be the duty of the Government to supply. What, I ask, is the purpose of the State in forming a Government if it is not for the promotion of the welfare of the people? Seven-tenths of our population are directly interested in agriculture, and the balance are indirectly interested, and know full well that their prosperity is always coincident with agricultural advancement.

If, then, it is the duty of the Government to give to the people the information that they desire, the question ultimately arises, how shall this information be disseminated? Through what channel shall it come? What medium shall be made use of in order to reach the people? The undoubted answer to that question must be, we must first use the various associations of farmers which are now in active operation in the country. What are these? The first and oldest among these are the Agricultural Societies. Following these come the Associations of Fruit Growers, Dairymen, Poultry Raisers, Bee-keepers, Sheep, Swine and Cattle Breeders, the Entomological Association, and last, and in some respects, the most important of all, the Farmers' Institute. All these associations can be and should be used in disseminating information to the people along the various lines representated by their organizations.

Let me speak of some of these organizations individually. Take the first and oldest, the Agricultural Societies. We find that the first one was formed in 1825. In 1830, the then Government passed the first statute granting aid to these societies. One hundred pounds was offered to any society that would raise half that sum—fifty pounds. The preamble of this statute is worth quoting here: "Whereas, it would greatly tend to the general improvement and prosperity of this Province if agricultural societies were established in every district, with a suitable endowment from the public funds," etc. Now, what was the object of the legislature of that day in passing that statute? It is plainly stated in that preamble—the object was to promote general improvement and general prosperity in this Province. But how was that proposed to be done? In the same way as we propose to carry on this development now—by the dissemination of the information needed by the masses of the people. Exhibitions were organized, that the

people might be shown the best products of the land, so that they might know what they themselves could produce and be led to imitate it. They were to have presented to them at these exhibitions proper ideals, which they might be expected to copy. It is not too much to say that many a young man has received his first inspiration to become the owner of a better class of live stock by gazing at those presented to the view at these annual exhibitions. The object lesson presented by the fruit display, or the display of roots has started many a man thinking, and has induced him to give better attention to his orchard and his garden. I am sorry to find, however, that in these days there are some persons placed in control of some of these exhibitions who seem to forget entirely what the legitimate object is. They seem to have lost sight of the useful, the instructive, and the educative idea, and have concluded that the exhibition should be made simply a place of amusement and entertainment. To spend public funds merely to amuse the people is, in my judgment, a wrong use of the powers given to managers of these exhibitions. It is educative, but it educates the wrong way. Besides, at most of our country exhibitions, the time occupied is only one day, and when these amusements and entertainments are presented, the time which should be devoted to that which is more useful and beneficial, is taken up with other things. Should gambling and mountebank performances continue to hold the chief place at some of these exhibitions, I have no hesitation in saying that ere long a demand will arise among our best citizens to have public support withdrawn from them. Some of these exhibitions have been so managed in this regard that respectable people feel that it is not a fit place for themselves and their children to appear. The whole control is in the hands of the managers, as seen from the clause in the statute, which reads as follows : "The officers of any such association or society, may, by their rules and regulations, prohibit and prevent all kinds of gambling, theatrical, circus or mountebank performances, exhibitions or shows, and also regulate or prevent the huckstering or trafficing in fruits, goods, wares or merchandise on the exhibition ground or within three hundred yards thereof."

The grant for these exhibitions has been increased from time to time. In 1852 they cost $27,000, in 1854. $40,000, and last year, 1892, we spent $73,550. No one will deny that it has been a useful expenditure, but the managers ought to keep to the original idea of educating and instructing the people.

The object of organizing all the associations I have mentioned, and of granting them aid out of the public funds is precisely the same—in order that through them information may be gathered and given to the people. It is, however, disseminated in a different form to that given by our exhibitions. It is conveyed through members' papers, published reports, etc., which the people are able to peruse in their own homes and put into practice as may be needed. I believe that at the present time we are making better use of these associations than ever before. No one will deny that there is great need for enlightenment along some of these lines. In dairying you have all seen what a wonderful tide has set in in favor of it, what a strong desire exists for instruction and information in that connection.

But there are other branches of our industry concerning which information is needed quite as much. Take, for instance, the business of poultry raising. It seems a trifling affair, but when one comes to consider the sum total much might be gathered from the farms of Ontario by a proper attention to this branch ; there is no one but will admit the importance of development along this line My Department estimates the total value of poultry products for 1892 to be over $3,000,000. The total value in the United States is given at $300,000,000. There is no single branch of agriculture concerning which more dense ignorance prevails as to the best methods, the best breeds and how to manage them, than in poultry raising. Most farmers have a few fowls about their farmhouses, but in the vast majority of cases they receive no attention whatever, and the profits derived from them are of small account compared with what they might be. Now, it is clear that through the Poultry Association, which is composed of bright, intelligent, energetic men, we might be able to give much information to the people, as well as enable them to take a much higher position with regard to this single industry than ever before. The same remark applies to nearly all the other organizations that I have mentioned.

I come now to speak of the youngest organization, the last on the list, viz.: Farmers' Institutes. I say that they are in some respects of more importance than the others, for the reason that they combine to some extent the work of all the others and cover the ground taken up separately by each of the other organizations. Matters appertaining to fruit, poultry, bees, stock raising, etc., are all discussed at these gatherings. The best and most essential information connected with these subjects is scattered at the different meetings. Again, you are aware that through these institutions my Department now distributes all the information gathered by the various other associations.

This brings me to speak of the necessity for increasing the membership of our institutes beyond the present limits. I would like to inspire the delegates who are here with a little more enthusiasm along this line. An examination of the returns sent in to my Department reveals the fact that too often the membership is changed from year to year; we find that we have, comparatively, at any rate, a new list for each year. I presume this is accounted for by the fact that many of the officers of the institutes have come to the conclusion that the only object of the statute forming these organizations has been carried out when two meetings have been held somewhere in the riding, and 50 members have subscribed their names, paying 25 cents each. I would point out to you that such was not the object contemplated. That much requires to be done before the grant will be given, but the grant is not given as a reward for this work, but as an inducement to continue the work and cover the remaining portion of the riding with meetings as far as possible. What I would like to see done is that every member placed upon the roll should be retained year by year, and new members continually added. Some hold the mistaken idea that when one once becomes a member of the institute he is always a member. This is erroneous, because the membership of an institute is the same as that of an agricultural society—it is annual in its character. If it be said, How will these meetings be held? I reply, use the funds that the institutes already have in their treasury for this purpose; the funds are provided for no other reason. Upon an examination of the treasurer's statements of the various institutes, I find that among a total of 74 there are only 25 having a less sum on hand than $25. The average of the amount on hand is $50, and in the majority of cases there is a sufficient amount to warrant an expenditure of funds in holding these additional meetings. If meetings cannot be held in every part of the riding, why not cause some of the officers to canvass the territory for members, and, if necessary, pay them a reasonable sum for so doing? In this way the membership would be multiplied largely, and instead of ten, twelve or fifteen thousand, we ought to have twenty-five, thirty or forty thousand members to whom this literature that I have spoken of could be sent from my Department.

In addition to utilizing all these associations, there has been provided for a similar purpose the Agricultural College and Experimental Farm at Guelph. I would like, because I think you will all believe what I say, to emphasize the good work which is being done in this school. I have no hesitation in saying that for a young man who has determined to be a farmer it is the best school in the province of Ontario. It is outside, in some respects, the regular school system. The studies there are all in the line of usefulness in connection with a young man's chosen calling. He will receive a good English education without the classics so necessary to a professional man. Chemistry, botany, geology, etc., have prominent places at this institution, and, in a word, the boy is enabled by the course given him there to fit himself for his life work in connection with his chosen calling. One of the disagreeable fruits of our ordinary school system is that it fosters a class of persons who seem to be studying merely to pass examinations. I maintain that any man who does that cheats himself, dwarfs his life, and, to some extent, wastes his opportunities; while, on the other hand, the young man who studies in order to fit himself for useful work in connection with his calling puts himself within the possibilities of future growth and continual development—he is increasing his power to do for himself, his family and his fellows. So I say, give the farmer boys a chance, and you will discover that they will at once take their places alongside of the professional man in every walk of life where intelligence and energy are needed. There is no danger of such education doing them injury. They will be required to work at manual labor every day they continue in the course, so that the body and the brain will be developed

together. It is sometimes said that the three R's are enough for a young man who is to be a farmer. I do not think so; certainly not as they are ordinarily understood. But in these days reading is spoken of as including all study, and in that sense I have no objection to the phrase. You may depend upon it that a thorough grounding in this sense in the three R's will equip a young man for work which never could be accomplished by him otherwise, and in his future life it will certainly be followed by three T's—thought, thrift and thoroughness—and by three P's—plod, progress and prosperity—and three E's—energy, enterprise and enthusiasm; and all of these bring to his life three C's—courage, comfort and contentment. Do you say that he can do as his father has done, and that you don't believe in these innovations? You may say that, but this improvement and development will go on all the same. When John Johnston, of Geneva, one of the most intelligent agriculturists of his day, was endeavoring to teach the farmers of his time the necessity of tile drainage, he was laughed at and called a fool who did not know any better than to spend his time and money burying crockery under the ground. When he was busy sowing upon his land land plaster he was told he was wasting his money, and that, although some immediate benefit might be received, eventually his farm would be ruined; that the man who sowed plaster might drink wine, but that his sons after him would be obliged to put up with water. Mr. Johnston's answer was that he would sow the plaster and drink the wine, and trust to his children to take care of the future. One hundred and fifty years ago Lord Townsend was busy teaching the farmers of England the importance of root culture and its great value to them. He, too, was laughed at and called "Turnip Townsend." When he secured his first drill for the purpose of sowing the seed their merriment knew no bounds, and it was said that he was "sowing pepper out of a cruet." Notwithstanding all this, these improvements have gone forward, and to-day the whole civilized world bows to the wisdom of the man who launched them at that time.

The best talent of our best young men, with all the education and drilling that can be given, can well be used in connection with agricultural pursuits. Immense fields of exploration are constantly opening the gaze of him who desires thus to investigate. Take, for instance, a pound of what is called in this city "gilt-edged butter," which is as simple an illustration as I can give you. I ask you to consider what that represents—I mean of intelligent labor and skill in its production. Every one knows that it cannot be produced unless the raw material which enters into the product is gilt-edged also. You cannot gather figs from thistles nor apples from the basswood tree; no more can a valuable dairy product be made from poor milk. But how is this raw material to be produced? Three things will be needed, better stock, better care and better food. This all seems very simple, but let us see what it means. If a farmer desires to be the possessor of better stock, what does that signify? It means better breeds and better selection, and no man knows how difficult a task he has undertaken when he determines to have a first-class herd of that description until he has tried to follow it out; it is a field which will demand the best energy and skill of our brightest men. Then the second point; better care means better buildings, better attention. Both these open up another field entirely distinct, which means that economy in feed and labor must be abundantly exercised. All this involves a study, the importance of which few are enabled to recognize. The man who gives proper attention to stock, so as to bring about the best results, must have learned to control himself as well as the cattle which he tends; he must have learned the golden rule to do to others as he would like to be done by; nay, more, he must have learned to return good for evil, and when an animal presents him with a kick in return to give him a caress.

To provide the third thing necessary—better food—opens up the whole field of farming operations, and includes a greater variety of suitable crops and how to grow them: the use of the silo and ensilage in winter and soiling in summer, to assist cattle on pasture, etc. A pound of butter is a very small thing, but to produce it of the very highest quality is a study which will demand the best intellect.

The good results at the Agricultural College can never be estimated. But the oldest among us cannot now take advantage of a course of that kind—it is only for the younger men—and its good results will be seen only in the future. In order, therefore, to bring

some of this instruction home to those who cannot attend, it was decided last year to open up in connection with the College a special dairy school giving a short course of two months. This course is open to all ; no standard of learning is fixed which will prevent any one attending ; both sexes are admitted, nor is there any restriction as to age. I knew that there was a demand for such school but I did not dream that the demand would be as large as it turned out to be. The room which we provided proves to be entirely inadequate. Two months before the school opened it was all taken up, and applications were made by thirty or forty more than could be accommodated. This school started on February 1st, and will continue through the month of March. I am looking for very beneficial results from the opening of this course. It is possible that it may be followed in the near future by other courses of a somewhat similar character.

I think that the time has now come when there should be some practical effort put forth to induce agricultural instruction in our common schools. It would appear that public sentiment has decreed that neither fame, position, wealth, honor, nor happiness can be secured in the country, and is to be found only in connection with town or city life. An undue porportion of your young people, male and female, are leaving rural life and rural pursuits for what appears to them to be a better place, but which is surrounded by uncertainties and difficulties. They seem to lose sight altogether of the beauties of country life, and of the pleasures that may be found there, and haste away to a field by them unexplored and entirely unknown. I do not say that some should not go, because I am aware that nature has fitted them for such a life, but what I do say is that hundreds are being lured away whose tastes do not lie in that direction. Already serious results are witnessed, and these results will be intensified in the near future.

Can nothing be done to stem this tide? I answer, yes, I think something can be done. I would like to see in all our common schools an effort made to change this mistaken sentiment. I would like that even the youngest child of these schools should hear something about the attractions and beauties of rural life ; about the importance and dignity of labor, and about the honor which may come to a man who excels in agricultural pursuits. The first step to bring about results in this direction is to provide properly equipped teachers for such a work. This undertaking the Government have decided to commence at once. It is proposed to open a summer school at Guelph during the summer holidays to which the teachers of our rural schools will be invited. There will be given a series of 40 or 50 lectures on subjects appertaining to agriculture, including chemistry, botany and geology, not with a view of fitting them in that short time to teach technical agriculture, but to prepare them to give a series of popular talks to the children on plant and animal life, nature of the soil with special reference to their immediate surroundings, and other kindred subjects which will naturally present themselves in this connection. No additional subject will be placed upon the school curriculum, which is already fully loaded, but the teachers will be advised to take up some of these subjects, say on Friday afternoons, a part of which is now usually devoted to reading, recitations, etc. The success of the work will naturally depend a great deal upon the skill and tact of the teacher, but it seems to me that the subject may be so presented as to interest even the smallest among the children. I think it is possible in this way to turn the attention of the children to the beauties in nature all around them, as also to the possibilities of rural life and pursuits. They will thus early in life see in their own home gardens, the fields and the waysides, attractions which have never been seen before. As they grow up they will want to know more of these subjects, and thus a demand will arise for a continuation of the instruction thus commenced. This scheme is but a commencement of this work. It may not be the ideal, but the expense of it to the country will be so small that it appears to the Government to be worth testing. Should the teachers make as good use of it themselves the next few years as they may, I think I can prophesy that within the next ten years you will find that instead of the brighest and best of our young people making haste to the city, they will be turning their attention to those studies connected with agricultural pursuits, which will in the end give such an impetus to the prosperity of this country as never before existed. At the conclusion of this course it is proposed to have a short examination, in connection with which a certificate will be granted which will give school trustees an idea of the attainments of the

teacher in this regard. I apprehend that a teacher who is successful in presenting these subjects will be worth more than one who has paid no attention to them. The cost of all this to the teachers themselves will be trivial. It may be found necessary to impose a small fee for the payment of the professors, who will be engaged during a portion of their holidays in this work, but there will be no expense beyond that, except the bare cost of board, which will be furnished to those who can be accommodated at the College at cost — say $2.50 per week. These are the means being adopted to promote the agricultural interests of this province, which you here represent. They are among the things which it is optional for a government to undertake, but which no government can neglect which has at heart the best interests of our people. I hope—indeed I know—that you can approve of all that is being done. Much more may be undertaken, as occasion may require, but all this of which I have spoken will utterly fail without the cordial co-operation of those for whom it is intended. What, then, is your duty? Plainly, it is to utilize the instruction offered. "You may lead a horse to water, but you cannot make him drink." So with this ample provision for advancement in these various branches—failure must come unless those interested are willing to receive it. Improvement is not accomplished at once ; we must add line upon line, precept upon precept, here a little and there a little, and keep incessantly at it until the whole mass of our agriculturists are imbued with knowledge and enthusiasm. When discouragements come and obstacles present themselves, is it our proper course weakly to give away under them and say, "I cannot, I cannot"? I say, decidedly no ! With back to back and shoulder to shoulder we help each other towards better methods and finer products until we overcome. When monopolies grind and oppress us shall we meekly submit our neck to the yoke and say, "It is well ; we are hewers of wood and drawers of water ; we must submit." I say, No, a thousand times, No ! We will unitedly assert our manhood, and protect ourselves and our families. When one class in the community sets up the claim that this country belongs first to them—that they have bargained for it, and must hold it forever—what will be our decision? From every man of us will come a vigorous protest. Our agricultural interests are first in importance, and if there is any ownership in that sense it is ours, and not theirs. We are not asking that we be given any advantage, but that everything which can be done shall be done for the highest welfare of the whole people. When interested persons deceive us, and induce us to support their schemes, and when by so doing we are brought, it may be, to the verge of ruin, they then laugh in our faces and say "You ought to be satisfied. You are well enough off. If you did not spend so much you would have more," etc., and then propose to us as a remedy for all our ills that we give up our heritage and transfer it to another land. What shall be our answer? It shall be, "No surrender?" Nothing has been done but what can yet be righted. To this work we will bend all our energies. We can rightly boast of our province. We know that it stands among the first on this continent for quality and quantity of production ; acre for acre, man for man, we take no second place. It is a goodly heritage, and we will not lightly throw it away. We are prepared to accept part of the platform of one of our political parties and show ourselves true to the old flag which is honored among all nations ; but in addition we shall be true, not to the policy of selfish men, but true to ourselves.

Moved by Mr. McIntyre, seconded by Mr. J. B. Muir, that the members of the Central Farmers' Institute heartily endorse the sentiments expressed by the Hon. Mr. Dryden, and that we further desire to assure him that we appreciate his efforts in the direction of assisting us to enlarge our knowledge in everything that appertains to the successful pursuit of our calling as farmers. Carried.

WOULD IT BE IN THE INTEREST OF STOCK-RAISERS TO IMPOSE A LICENSE UPON ALL MALE ANIMALS HELD BY OWNERS FOR SERVICE?

Mr. J. B. Ewing read the following paper :

You have listened with a good deal of attention and interest to Professor Shaw while he has shown you that it would be millions of dollars in the pockets of Ontario

farmers if they would but exterminate the noxious weeds that grow upon their farms. Professor Robertson has also shown us how our profits may be increased by millions annually by having a cheap and well balanced ration for stock. D. M. Macpherson also comes forward with his quota of millions for Ontario farmers if they will adopt his greatly improved methods of dairy farming.

Now, sir, I would not for a moment compare myself with any of the gentlemen just mentioned, as I am only a farmer from one of the back townships of this province. But I will endeavor to lay before you a scheme which, if adopted, will I think add its millions of profits to Ontario farmers. The subject, you will see at the outset, is one of great importance and interest, and one, some will say on the first impulse, with many conflicting conclusions. The subject is also quite a new one, but do not be hasty in condemning it on that account; or do not think it is a scheme got up by a few individuals with a selfish object in view, for I assure you it is not; but, on the other hand, it is one that is the engaging serious, and I may say favorable consideration of many farmers and stock-raisers in this province at the present time, and one that should receive our favorable consideration if it can be made practicable, and I believe it can. It is true that there is not another country under the sun that I know of that has an exact precedent of this. I cannot point to any other country and say, "Such a country is prospering under such a system as I am endeavoring to lay before you." But what of that? Are the so-called intelligent farmers of this province always to be imitators and not originators? You are perfectly well aware that many of the ways and means we have had of making a little money in the past have been closed up or played out, consequently we have to look around for other sources to keep up the much needed profits. For instance, a practical miner who starts out looking for gold will not, as a rule, spend his time searching and digging over old claims that are played out. No! He turns aside from the well-beaten track into the as yet unexplored region. And if he is in a country well adapted for what he is looking for, is a keen observer and understands his business, it is highly probable that he will soon find something that will pay him to work. So will we, gentlemen, find ourselves upon a new track if we adopt this system of taxing male animals, and on one which, I think, if we follow it with perseverance, intelligence and skill, will pay us well and handsomely for leaving the old humdrum track we so long have followed. I think it would place the live stock business of this country upon a better basis. It would be also eminently successful in gaining the point that its promoters most desire, that of crowding out that most undesirable acquisition in stock raising known as the scrub sire, whose baneful effects are far too noticeable upon many of the flocks and herds of this province. It does not need a second glance at many of the carloads of cattle on their way to market to see the evil effects of this progenitor of scrubs. It does not need a keen observer by any means to see its effect upon many of the flocks of sheep in this province. The effects of the scrub sire are probably less noticeable among pigs than anything else. But among horses the condition of things is deplorable indeed. Horse buyers tell us that in order to get a carload of horses such as the market requires they have to travel over a great extent of country, only getting such an animal as they want about every twenty or twenty-five miles, consequently making it a very expensive business to buy horses, and seriously against the price of the animal. In many districts of this province a good sire is not available, and in other districts where they are available they come in such close competition with the scrub element that they prove a very unprofitable investment to their owners; as a great number of farmers, I am sorry to say, will persist in using, to their own detriment, the service of a sire costing from $2 to $5, often getting what is known as a general purpose horse—a horse that is not asked for in the markets of to-day, but more often getting a no purpose horse. The results of breeding to either grade or scrub sires, no matter how perfect they may be in themselves, must always be attended with a great amount of uncertainty, for the old saying that blood will tell comes more especially true where scrub blood predominates. Some may think that it is an interference with individual rights. Such is not the case, as I do not pretend to say that we will discriminate between the two in the way of a license; but we do hope that under a license it will prove an unprofitable investment to keep a scrub sire. As far as the rights or wrongs of this system go, I do not think there is anything very wrong in taxing or

interfering in any way with a man who is perpetrating that which is against the interest and prosperity of the community in which he resides. I believe if this system had been adopted ten or fifteen years ago the live stock of this Province would have been worth millions more than it is at present. I believe that if we adopt it now that in a few years it will place this province away up the attic story of prominence as a stock country. As soon as it becomes generally known that we have such a system in operation here we would have great numbers of buyers from other countries in spite of tariff restrictions. There will be a good demand yet for years for all classes of stock of the right sort. There are countries as yet only partially civilized, while as civilization increases the demand for things that accompany civilization will increase Japan, for instance, has commenced to import milch cows. They very soon will want some fine carriage horses and other stock. Other countries will follow, and let Canada or our province at least, be in readiness to supply them. I do not think it is necessary to have any extra officials to carry this system into active operation. It could be done by township assessors and collectors, and the fees turned into the treasury of the township agricultural societies to be paid back in premiums to those that keep the best pure-bred males. In this way I think we could not only crowd the scrub sire out, but the scrub farmer as well, or rather transform him into a more desirable citizen. It would have a tendency to induce him to exhibit his stock at the agricultural shows. It is a very noticeable fact indeed that as a farmer take sufficient pride in his stock to bring them out to these shows it is a commencement of better things on his part. He becomes more interested and enthusiastic in his business, and enthusiasm is something that is very much needed in farming operations at the present time.

The PRESIDENT: We are here in a measure as guests of the city of Toronto. Although we have opportunities to visit and hold our meetings in other cities, we have always considered it our duty and our pleasure to visit Toronto, the centre and hub of the province. We have the Mayor with us this evening and I think we shall be glad to hear a few words from him.

Mayor FLEMING: Mr. President and Members of the Central Farmers Institute: I thank you for your kindness in inviting me to take a seat upon the platform, but my good sense will prevent me intruding upon your programme any remarks of mine. I know you are here for the purpose of listening to discussions of those subjects which are of so much importance to the farmers of this country. We realize the advantage that this institution is to the farmers of the community; and we realize the advantage it is to the city of Toronto to have the farmers of the country prosperous. Prosperity among them means prosperity for us, and we sincerely trust that they will go on and prosper more in the future than they have in the past, and when you have made your fortunes on the farms we invite you to come and reside in Toronto. We are glad to see you here holding your Convention, and anything I can do to make your stay a pleasure I will take delight in doing. Applause.

HOW I HAVE SUCCEEDED IN WINTER DAIRYING.

Hon. T. BALLANTYNE, M. P. P., Speaker of the Ontario Legislature, gave the following address:

I have succeeded as I expected, fairly well. By winter dairying I suppose is meant butter-making in winter. Until recently dairying has been confined to the summer season, and cheese dairying still is. It was supposed that spring was the proper time for a cow to calve, and the grass season the only profitable one for butter-making, but our neighbors in Illinois and Wisconsin, who have been practicing winter dairying for some time, claim that they get a larger quantity of milk from the cow if she calves in the fall. Some four or five years ago I thought I would try it in a small way in connection with my farm I had been actively engaged in cheese dairying for the last quarter of a century, and we have made cheese dairying a success, but one of the great difficulties connected with it was that you could not raise calves. Now by having a percentage of the cows calve in the

fall, the calves can be fed on the skim milk returned from the creamery and they seem to thrive. By this means you are able to breed for the dairy, and you will never have a herd give a large average until you do that. I visited the dairy districts of Scotland, where there is more attention paid exclusively to dairying than perhaps in any other part of the world, and I found there that the cheese maker has to give the farmer 480 pounds of cheese for every cow and 360 for every heifer. That seemed almost incredible to me, because at that time our cows would not average 300. Now that is not an excessive quantity; it is not more than any one can get if careful in breeding and raising dairy stock. I looked up some of the figures and found one man who had seven cows and one heifer, and he received from the factory after paying all expenses $468.84, an average of $58.23 for each cow. The factory was running exactly seven months. The cheese that was made from these cows was 5,477 lb., or 684½ lb. for each cow. There is no difficulty in grading the herd up, but you must have warm stables and feed the cows a well balanced ration. We weigh all the milk, and you never fully realize the loss from keeping inferior stock until you weigh all the milk. I have one cow which in one year milked 12,415 lb.; another in ten months milked 11,000 lb.; another in 9½ months 10,000 lb. I cannot conceive that a cow would give the same amount in the same time if she should calve in the spring. These cows had no particular breed but were bought for their milking characteristics; they had every indication of being good milkers. We have cows milking 50 lb. a day. I question if they would do that on the grass, but you must comply with the conditions: warm, clean, well-ventilated stables, abundance of water, and access to salt at all times. As to feeding, I have not a silo, but I raise about ten acres of corn the same as for the silo, and put it up in large shocks, then it is hauled in and run through the straw cutters. I have about sixty cattle, and we have been giving them all they can eat twice a day of that corn, about twenty pounds of it, and about sixty pounds of clover hay, and a bushel of mangels. I doubt whether a cow can do its best without a proportion of roots. They seem to perform a certain function in animal economy that enables them to assimilate their other food. We also give about ten pounds of bran and grain. I am not prepared to say that five pounds would produce the same result. Professor Robertson says it would; that is not our experience.

A MEMBER: How many times a day do you feed?

Hon. Mr. BALLANTYNE: Twice a day, but we give a little hay at noon, and the grain, roots and corn stalks are all given together, night and morning. We water them in the stable; there is a trough in front of them which is closed during the day except at certain times, and left open at night.

A MEMBER: Do you curry them?

Hon. Mr. BALLANTYNE: Yes, they are kept as clean and sweet as possible; the stable is a great deal cleaner and sweeter than this room. You must have a clean stable if you want flavor in the butter.

A MEMBER: Do you use stanchions?

Hon. Mr. BALLANTYNE: No, we use chains. Of course in a herd of twenty-five you may assume that two or three will miss; I think the reason of this is that the bulls do not get enough exercise. A bull should not be over-fed or pampered; he should be allowed to run out and get all the exercise he can. I have had no more difficulty in getting the cows to calve in the fall than in the spring.

A MEMBER: At what temperature do you keep your stable.

HON. Mr. BALLANTYNE: That will vary, but we like to keep it between 50° and 60°.

A MEMBER: What does your butter average in sales per pound?

Hon. Mr. BALLANTYNE: We have not sold a pound for less than 25 cents.

A MEMBER: About what does your milk test?

Hon. Mr. BALLANTYNE: The butter-fat? I cannot exactly answer that question. We have had it vary from, I think, 3.55 to 5 and sometimes nearly 6.

A MEMBER: Do you recommend a ground floor in preference to a wood floor?

Hon. Mr. BALLANTYNE.—I think a concrete floor the best? a bed of stone and cover it with water lime. We have a lot of loose boxes for calves and for hospitals; they are floored with clay, as hard as possible.

A MEMBER: Where do you market your butter?

Hon. Mr. BALLANTYNE: In Toronto.

A MEMBER: Do you turn out your cows?

Hon. Mr. BALLANTYNE: The milk cows are not turned out in winter. The other stock are all turned out.

A MEMBER: What do you do about the color of the butter?

Hon. Mr. BALLANTYNE: There is not sunshine enough to keep up the color, but there is no difficulty about that, use a little annato; you can have any color the trade wants. I Scotland they prefer pale butter; they will not take it high colored

TAXATION OF FARM LAND IN VILLAGE CORPORATIONS.

A MEMBER: Will Mr. Awrey say what has been done or is likely to be done with regard to the taxation of farm land in village corporations?

Mr. AWREY: I suppose that question is asked in consequence of a resolution passed last year by this Institute, asking the Legislature to relieve certain farm lands of taxation The Legislature complied with the request of this Institute. I introduced a measure which exempted farm lands in towns and incorporated villages from taxation for certain purposes. In the first place it is assessed as farm land. In the second place it is entirely exempt from payment of taxes for water rates, for lighting and for police protection and sidewalks. So that hereafter in places like Whitby, for instance, and towns of that description, the taxes on land used for farming will be reduced 50 per cent. at least. The method you have to adopt is this: under the Act it is compulsory upon the municipalities to pass a by-law declaring certain lands to be farm lands and to be relieved from taxation for certain purposes. The limit is only five acres; if you have five acres that you are using for farm purposes you can have it assessed as farm lands and relieved from the taxes I have mentioned. The idea I had was that the farmers did not require, for instance, police protection, or to have policemen looking after them at all. The Legislature, after a very strong effort, for I think we only carried it by three or four (every man who lived in a town opposed the measure), passed the bill, influenced, I think, by the fact that I was backed up by the power of this Institute. If that bill had been passed thirty years ago the farmers would have paid $80,000 less in direct taxation.

INTER-STATE COMMERCE RAILWAY ACT.

Moved by JAMES MCLEAN, seconded by JOHN HUNTER, "That the Central Farmers' Institute advocates that the Inter-State Commerce Railway Act be put on the Dominion Statutes this session." Carried.

The meeting then adjourned until 9 a. m.

THIRD DAY—MORNING SESSION.

The President took the chair and called the meeting to order.

CO-OPERATIVE WORK IN AGRICULTURE FOR SEVEN YEARS.

Mr. C. A. ZAVITZ, Experimentalist at Ontario Agricultural College, was introduced, and spoke as follows: I did not know that I was going to speak to the members of the Central Farmers' Institute until the night before I left Guelph, when President Mills said he could not be here, and asked me to bring along the work of the Experimental Union, which I presented at the annual meeting held last summer; and as I am a representative from that Association, I said that if it was necessary, if there was

time to present that before the meeting, I would be willing to do so. I wish to thank you for giving me this opportunity to bring before you the work that is being carried on, not altogether by the Agricultural College, but the co-operative work between the College and the farmers. This Union, destined, I think, to be one of the strongest associations in the Dominion, is a sort of connecting link between the Agricultural College and the farmers, for it is formed of the ex-students and the students and professors of the College. It was started fourteen years ago, and the principal object at that time was to keep up the association of the ex-students with the College. An annual meeting was held, largely attended by the ex-students, but it was considered that in an age of advancement such as this, the association should be more active. We saw experimental associations starting up, not only all over America, but all over the world, and if we are to keep up, we must have not only our experimental stations, but every farmer must be an experimenter himself. It will not do for us to come and listen to theoretical and scientific addresses unless we try to put those addresses into practice. In 1886 we started a system of co-operative work all over the Province; we had one experiment in fertilizers; in 1887 we had one experiment; in 1890 there were four experiments, and in 1892, twelve experiments. These experiments and their results are all mentioned upon sheets, such as I have here, and no doubt most of you have received them. During 1892, we received full reports from 1,585 plots throughout the province. The real value of our work is individual experiment; it gives the farmer the key-note to his own land. In some cases we found the nitrate of soda plot would give three times as much as the plot with no fertilizer. The mixture was composed of nitrate of soda, potash and superphosphate in equal proportions. These are the constituents of all fertilizers. The figures I have here form but a superficial report of the work, but if you will look in the latter part of the report from the Agricultural College you will see the result of each individual experiment—the result obtained by every farmer who carried on the experiment, the nature of the soil, the cropping the previous year, and how manured. The true value of this work, as I have said, is for the farmer himself. Supposing he wants a new variety of grain, he can take these varieties and grow them side by side and see which variety will grow the best on his own land. I ask you to look very carefully into the latter part of the College report and watch closely the result of the Union work. Professor Shaw asks me to mention here about the grains we have for sending out at the present time, and the two ways we have for sending them out. In the first place we have this list, and anyone who wishes to carry on an experiment of this kind, if he will write to us at the College, will receive this sheet, and we will be very much pleased to receive his report at the end of the season, and will summarize the results. Those who wish to buy grain should write to Professor Shaw, and those who wish to get grain for experimental purposes should write to me. We will have our annual meeting at the College, where all these subjects are discussed and the results of the experiments brought in, not only in agriculture, but in arboriculture, and so on, and all are reported at the annual meeting in December. I wish now, on behalf of the members of the Experimental Union, and also as a representative of the College, to invite you all there. We have a large hall, capable of holding 900, and we invite you all there to hear a more detailed result of these experiments.

The PRESIDENT: I regret exceedingly that we have not more time to give to the discussion of this very able address. Mr. Dryden is here and wishes to make an announcement.

A VISIT TO THE PARLIAMENT BUILDINGS.

The Hon. Mr. DRYDEN: I wish to say that I am commissioned by the Ontario Government to invite the delegates here assembled to inspect our new Parliament Buildings. We would like you to come up as far as you can, in a body, and we will have someone to pilot you around. The buildings are not quite completed, but we would like to have you examine them. We think you will all go home feeling proud of our buildings. They are not extravagant, not ornamental perhaps, but they are plain, substantial, useful and com-

fortable, and I think these are the qualities buildings should have. My Department you will find in the east wing, at the right hand; I will be glad to see you there, and I think all the members of the Government who are in town will be present this afternoon, and I would like to introduce some of the members to them. (Applause.)

It was then resolved that the invitation of the Minister of Agriculture be accepted and that the members of the Institute attend at the Parliament buildings at two o'clock.

The adjourned debate on Mr. McEwing's Free Trade resolution was then resumed.

Mr. PETTIT: I move that this be referred to in the usual order of business to the Committee and they can report when they are ready. Let the Committee report on it and then we will deal with it.

Mr. MCEWING: I beg leave to state that a number of the members of those committees have gone home. If we adjourn at one o'clock, when is that committee going to make a report on any of these subjects?

The previous question was then moved and seconded.

Mr. MCCRAE: I claim the floor because I moved the adjournment of the debate yesterday. A motion has been made of the previous question and I seconded that; although I am entitled to the floor, I will withdraw that claim on condition that the main question be now put.

The PRESIDENT: I for one would like to see this question thoroughly discussed, but if you are determined to force it upon the meeting, it is my duty, I presume, as chairman, to put the motion.

The motion was then put and declared to be carried.

MODE OF ELECTING OFFICERS.

Moved by Mr. CLARKSON, seconded by Mr. LONGMORE: "That the resolution passed last year respecting the mode of electing the officers in so far as it relates to the election of the candidates for the offices of President, Vice-President, Secretary-Treasurer, and Auditors, be rescinded." Carried.

WINTER DAIRYING.

Vice-President MACPHERSON then gave the following address on "Winter Dairying": I am proud to see that the Farmers' Institutes have sent a number of young men here; this augurs well for the future. We are here for the purpose of obtaining practical knowledge, and I shall strive to present some new thoughts to you that perhaps may stir you to thinking. You all know the value of our land is going down, and that the young men of our country are leaving us. Every farm in its true sense is a granary; every field is a bin in that granary. Every field represents a certain standard of fertility; every acre represents so many bushels of grain, so many pounds of milk, of beef, or of any article. Strange to say, many of our farmers do not realize the importance of the fact that the constituents of one article represent the constituents of another. We see the large amount that is sent out of the country of the fertility of the land, but let us stop to reflect how much is lost on our farms, in our stables and on our lanes and roads. I have made out a careful estimate, from practical experience, of the manure value an animal produces during the year. I have placed it at $12, taking the constituents of a normally fed animal in twelve months; I have divided that by four, so as to be on the safe side, and have taken one from that and have made the average loss in the year on the 770,000 animals in Ontario to be nearly $2,000,000. I can give you a proof that that is correct. What do we find throughout the length and breadth of this land? Fields are getting poorer, crops are getting less, and the result is that farms are less in value. That is a proof that this fertility is being taken out of our country. A statement has been made here that we must educate the young men to understand farming and remain on the farm. I take exception to that statement. Collegiate education is a good thing,

but what is more important than the education which a young man gets in the practical experience of working his own farm? What memories so lasting as those imprinted on his mind between the ages of twelve and twenty-one? And if the education he receives on his father's farm is that the land is depreciating in every way, that debts are increasing in every way, then I tell you young men are leaving the farm as the result of the education they receive there; the experience they are getting on the farm is driving them from the farm. The remedy is to enrich our farms; to put more grain in our bins; to make larger crops and greater profits. We must find out the cause if we are to control the effect, and I appeal to the young men here and to the young men who have left our country, if they have not left the farm because they found from experience that they could not make a living on the farm. The way to remedy that is for the old men to give them an object lesson that they can redeem the situation. Instead of shipping off or losing millions of dollars worth of fertility they must put it on the land. You may ask, what has dairying to do with this? Gentlemen, dairying is going to do it There is a time and place to do it; the time is the winter, and the place is the stable and the dairy. I find I can take one dollar's worth of fertility, and through the medium of the cow I can make from $6 to $10. You say that is a physical impossibility. I can take a dollar's worth of a balanced ration and it will give me 700 lb. of milk. One dollar's worth of hay will give me 750 lb. of milk. A ton of hay will give me 5,000 lb. of milk. A ton of cotton seed meal will give me 7,820 lb. of milk. A ton of oat-straw will give 2,000 lb. of milk You say these figures are impossible. Gentlemen, let the experts in agricultural chemistry figure this out and you will find I am correct. What does it cost to change one dollar's worth of food into 700 lb. of milk? I find, taking labor and all expenses into consideration, it costs $2, and if you can make that $3 give you $6, is there any business to-day where 100 per cent. can be made in as short a time? Why is it, you say, that we are not getting this? Because we take a dollar's worth of fertility and put $6 worth of labor and sell it for $7. The pastures of our country to-day are only giving an average of 1,000 lb. of milk per acre.

I will give you my personal experience. I was driven from the farm as many young men are driven to-day in this country, and for eighteen years I was off the farm. Four years ago I rented a farm on which there was not a single field that would produce a good crop of anything. The land is sandy and light. To-day there is not a field that will not produce anything I wish. It is under perfect control. Four years ago the gross produce estimated from a careful inventory only amounted to $800. There are 130 acres of arable land, and for the last two years I have produced over $4,000 worth of product; that is the market value, from a careful estimate, of all the products of the farm. I did it through the cow. I did not under-drain. I surface drained and cultivated as usual, but I depended on fertility rather than cultivation. To-day our cultivation is sufficient, but the fertilization of our farms is deficient.

Why do patent medicine men make money? Is it not because they can take 10 cents worth of a drug and by a little manipulation and a few cents of labor make a dollar's worth of medicine? Now, why should not a farmer take 10 cents of chemical matter and make $1 worth of product with perhaps 30 cents of labor? We must buy a cheap article and by a little labor and skill make a dear article. The trouble is we are converting our resources into cash and we have become spendthrifts. We should be accumulators; we should enrich our land from year to year and sell a dear article for a small outlay. When we know our business we will put our experience and skill into practice and reap the reward we ought to have. Then instead of land depreciating in value you will see it going up, and you will find the intelligent and intellectual young men remain on the farm.

A MEMBER: What is the average and least amount you have paid during the season in your creameries?

Mr. MACPHERSON: The creameries have paid 74 cents. The results to the patrons have been from 73 to 74 cents. The cheese factories have paid in the same time 74 to 76 cents.

A MEMBER: What do you charge per pound for making?

Mr. MACPHERSON: The price is 1½ cents per pound. We have our own conception of winter dairying. It means several things; the production of milk, and, also I claim, the production of animal growth. You can turn milk into cheese in the winter just the same as into butter. I think we are creating a wrong impression in this country; we are overdoing butter. I converted one cheese factory into a creamery in the first half of November. My cheese made from $1.03 to $1.07, and the next week when working as a creamery I only made 95 cents per hundred. Again, in skim milk, one man will make the value of skim milk 12 cents, and another will only make it 6 cents. It is just as we use it. I believe the future of winter creameries will be where two or three cheese factories can centre in one; and that central factory should be a combined factory, so that if the market value of butter goes down you can turn in a day to make cheese. I am creating centres in my factories. In one case I have sixteen factories drawing into one centre, and the patrons have been well satisfied so far.

A vote of thanks was then carried unanimously to the vice-president for his address.

AGRICULTURE IN THE PUBLIC SCHOOLS.

The following resolution was moved by T. G. RAYNOR, and seconded by D. E. SMITH:

That we, the members of the Central Farmers' Institute, hereby express our high approval of the action of the Education Department in preparing a school text-book on the subject of Agriculture and placing the subject of agriculture on the public school curriculum; but we regret to observe that notwithstanding this is done the subject remains practically untaught in our schools, and we believe that the subject will remain practically untaught so long as it is not made a part of the regular obligatory work prescribed to be taken at the public school leaving and high school entrance examination.

Therefore we would urge upon the honorable the Minister of Education:

1. The propriety of making the subject of agriculture, to such an extent as may be found expedient, a part of the regular obligatory work prescribed for public school leaving and high school entrance examination for all candidates coming up from rural public schools.

2. That all third class teachers should be required to show some knowledge of the principles of agriculture before being granted licenses to teach.

Furthermore, that a copy of this resolution be sent to the honorable the Minister of Education, and also to the secretaries of the various local institutes throughout the Province with a request that the local institutes discuss and pass a resolution on it and send said resolution to the secretary of the Central Farmers' Institute.

Moved in amendment by Mr. PETTIT,

That this matter be referred to the Executive Committee and sent out to the institutes, as the institutes will be better prepared to discuss it next year.

The amendment was lost. The original motion was then carried.

PROPOSED AMENDMENT TO COMPENSATION FOR INJURIES TO WORKMEN ACT.

Moved by Mr. PETTIT, seconded by Mr. MOWBRAY:

That in the opinion of this Central Farmers' Institute legislation should be asked for from the Ontario Legislature at its forthcoming session to amend chaptor 30 of 55 Victoria as follows: Sub-section 2 by adding the following words after the word "Act": "Save and excepting where such employers shall be engaged in the ordinary works of the agriculturist, including husbandman, gardener or fruit-grower," and that sub-section 3 be amended by striking out in the third line thereof the words "servant in husbandry."

Mr. MURRAY PETTIT: This Act was urged upon our Legislature by the labor organizations of the towns and cities to protect the laborers engaged in the more dangerous classes of work; and under the working of this we, as farmers, practically

insure the lives of every man we employ, either by the day, month or year, against accident, injury or death, to the amount of $1,500. We propose to ask the Legislature to remove this burden from agricultural labor. We took legal advice on this matter, and I will give you the illustration our lawyer gave us. He said: "If you send your man with a spirited team into the city and this man takes too much to drink, the team runs away and he is permanently injured, you are responsible to the amount of his earnings for three years, or $1,500." I believe if the farmers fully understood the working of this Act they would stand a unit in support of this motion. I cannot understand why farmers should be subject to an Act made to protect the workingmen of the towns and cities. The motion was then put and carried.

Moved by Mr. GREGORY, seconded by Mr. RAYNOR:

That a delegation composed of Mr. Murray Pettit, the president and Mr. Awrey be appointed to wait upon the Government and urge the amendment of this Act. Carried.

RESOLUTIONS.

Moved by THOMAS STRACHAN, seconded by D. N. MCINTYRE,

That the farmers of this Institute representing ridings from all parts of the Province of Ontario are desirous of recording their belief that so far as their knowledge goes regarding the health of Canada's herds that they are free from any contagious diseases whatever, and it be an instruction to the executive of this Institute that they take such steps as will bring this matter to the attention of the proper authorities if possible to remove the obstacles now placed upon Canadian cattle entering the British markets without being slaughtered at the port of entry. Carried.

Moved by JAMES DICKSON, jr., seconded by WILLIAM KEITH,

That it is the opinion of the members of this Institute that it would be to the great advantage of the cattle feeders of Canada if corn were admitted free of duty.

After some discussion the motion was carried.

The Legislative Committee reported favorably on the following motion: Moved by Mr. MOHR, seconded by Mr. KIDD,

That this, the Central Farmers' Institute of Ontario, memorialize the Dominion Government to place a uniform duty on all grades of pork coming from the United States into Canada. Carried.

It was moved and seconded that those papers on the order paper which have not read be taken as read and embodied in the report. Carried.

Moved by Mr. PEART, seconded by MURRAY PETTIT:

That the Dominion Government be petitioned to place coal oil on the free list.

The motion was referred to the Committee on Legislation.

REPORT OF THE COMMITTEE *RE* THE RETIRING PRESIDENT.

The special committee appointed to draw up a resolution respecting our retiring president beg leave to report as follows:

That this meeting desires to place on record its hearty appreciation of the services of our worthy president, Mr. N. Awrey, M.P.P., for the past three years in the display of his great executive ability, his impartial ruling, and his untiring zeal and earnestness in advancing the agricultural interests of this country. We also express our cordial approval of the good work he is doing for our Province as Ontario Commissioner for the Chicago Exhibition, and we hope and trust that he will be long spared to enjoy his present honors, and even greater ones, at the disposal of his fellow-countrymen.

A vote of thanks to the press for the full and satisfactory manner in which they have reported the proceedings of this Convention was passed.

The meeting then adjourned *sine die*.

ELECTORAL DISTRICT FARMERS' INSTITUTES.

SELECTED PAPERS READ AT JANUARY MEETINGS, 1893.

HOW TO MAINTAIN AND INCREASE THE FERTILITY OF OUR FARMS

BY H. B. SHARMAN, B.S.A., ASSISTANT CHEMIST ONTARIO AGRICULTURAL COLLEGE, GUELPH.

At one of our Institute meetings last winter an agriculturist of many years' experience and success, who had in his time been a large purchaser and exporter of farm produce, was for many years a member of Parliament and is now in the Senate, made the assertion and reiterated it again and again in the course of an address—"Clover is the ground-work of successful agriculture." Those who have come much in contact with the most practical and successful farmers throughout the Province, have repeatedly heard the same statement made in different forms. We may find it profitable to consider this claim.

Successful agriculture is dependent upon successful crop-growing. This is true no matter what may be the special line followed. Ultimately the question of success is reduced to the question of how much success attends our crop-growing. This is at once evident if our income be derived directly from the sale of grain and fodder; but if we aim to send off only what we might term the *condensed* products of the farm, as beef, pork, milk, butter, cheese, it is equally true, inasmuch as the quantity of these latter and in some measure their quality is regulated by the success attending the production of the raw material. Thus it is that while thoughtful and progressive farmers have ceased to grow grain as the only direct source of their revenue the question of "How to maintain and increase the fertility of our farms," or, in other words, how to successfully continue to grow grain and fodder, is of the most vital interest and will always continue to be so.

The crops of the farm derive all of their food from two sources, the air and the soil. The former of these is practically exhaustless as a supply; the latter is exhaustible, its term of fertility being determined by its original composition.

The plants of the farm are of very complex composition; that is they contain a large number of chemical elements united in various ways to form many different compounds in the different parts of the plant. All of these elements contained in the mature plants have come as we have said from either one or other of the two sources, air or soil. No plant can live *entirely* either upon air or soil; it must draw something from each in order to its growth. Some of the elements which are found on analysis to exist in plants are not absolutely essential to their existence; they are simply taken up by the plant because they are found in the soil in suitable form for the plant's assimilation. But even when these are disregarded we find that it is not possible to bring a plant to maturity unless there be sufficient supply of a large number of different elements.

No food passes into a plant unless it be in either one of two forms, a gas or a liquid. What comes into a plant from the soil must first be dissolved in the water of the soil. Thus it is that drouth has its effects. It is not that the rain has in itself structure-building elements, but it serves as the transporter of these as prepared in the soil. The value of a soil for the growth of any particular crop in any particular season does not depend upon the amount of plant food which it contains but upon the amount of *available* plant food, that is, plant food which is dissolvable in the water of the soil, and consequently capable of assimilation by the crop.

While it is true that a plant contains a large number of elements which must be supplied before the possible growth of a crop, the question of maintaining the fertility of the soil does not involve the consideration of supplying to the soil all of these elements: for several of these come from the air, and any ordinarily fertile soil contains a practically inexhaustible supply of most of such of these as the plant draws from the soil.

The question of soil fertility is much simplified from the fact that, with the exception of three, or at the most four, of these elements, there exists in any ordinary fertile soil, an abundant supply for an indefinite period of crop production.

The whole question of maintaining and increasing the fertility of any soil, then, resolves itself down to the question of supplying these three or four elements of fertility. Provided any soil be sufficiently supplied with these it would be possible (other conditions as to cultivation, drainage and so forth being supplied) to grow crops year after year upon the same field without any diminution of yield, in fact with a growing increase of yield. This has been done in practical experiment.

To scientists these constituents of fertility are known as nitrogen, phosphoric acid and potash; the fourth, generally present in abundance in soils but occasionally needing to be supplied, being lime.

When we have solved the question of the cheapest means of acquiring these and supplying them to the soil we have answered the question which at the outset we proposed for ourselves.

Nitrogen, phosphoric acid, and potash are not however, of equal value. They are equally essential to the plant but when purchased commercially we have to pay different prices for them. Of the three nitrogen is much the most valuable, phosphoric acid next, and potash the least. Nitrogen is worth on an average four to five times as much per pound as is potash. It becomes very evident, then, that the most vital question in the production of a crop is the maintaining of a supply of nitrogen. It has been pointed out that the plant can draw from only two sources, the air and the soil. Of the three ingredients which must be supplied (nitrogen, phosphoric acid and potash) the air normally contains none of the two latter. Of nitrogen, however, it contains an unlimited supply, for about three-fourths of our atmosphere is this gas.

It would seem therefore, at first sight, as plants feed from the air as well as from soil, and since three-fourths of the air is nitrogen, and nitrogen is the most important constituent we have to consider, that the difficulty of a supply of nitrogen is easily cleared. But as a matter of fact, decided from experiment, it has been found that but few plants are capable of assimilating the free nitrogen of the air. Most plants require to have their nitrogen supplied in the form of compounds of nitrogen from the soil through the roots. If scientists could discover that any particular plant or class of plants was enabled to store up in its tissues nitrogen from the air, it is evident from what has been previously stated that the great question of maintaining the fertility of the soil would be practically solved, so far at least as the most important, because most costly, constituent is concerned.

As a result of investigations carried on within the last few years by most painstaking and reliable scientists in America and Europe it has been quite conclusively and finally proven that a certain class of plants are capable of assimilating the free nitrogen from the air. This class is what is known to scientists as the leguminous family, which includes such familiar plants as the clovers, peas and beans.

It is a matter of common observation that on the roots of some clover plants, particularly those of considerable age there exist noticable protuberances or nodules. Investigation has proven that these are the seats of minute microscopic organisms which in the course of the successful accomplishment of their life's history are the medium by which the nitrogen of the air becomes assimilated and a part of the tissues of the plant. Thus the agriculturist has in these legumes a means whereby he may appropriate from an exhaustless source (the air) that plant constituent of which the soil is soonest robbed and which otherwise would be the most costly to replace—nitrogen. For the farmer of the future, therefore, the question of nitrogen supply is practically settled, is no longer a question of heavy expenditure for artificial nitrogen fertilizers, but of the judicious introduction into the rotation of leguminous crops particularly clover. But he will also find it to his great profit to grow large crops of peas. No straw produced on the farm can

compare with pea straw in feeding value when properly handled, and no grain is at all equal to peas as a supplement to the fodder now so largely used—ensilage. The pea crop has not had the place in the past that it should have had in the rotation of the majority, but if our interests are properly understood it is destined to be more largely grown in the future. In the handling of the clover crop for the purpose of supplying nitrogen to the soil the practice of plowing under should be followed. Greater benefit will be derived from plowing under the second crop than the first. Many of those who have used the clover crop as a means of enrichment have practised cutting the first crop and allowing it to lie where cut. Then at the time of the maturity of the second crop both are plowed under. Realizing the great value of clover as a means to fertility many now practice sowing it with every second and indeed even in some cases with every crop. So much with respect to the supply of nitrogen. As to phosphoric acid and potash, they must be largely made up by the use of artificial fertilizers. There is, however, one source of supply, the full value of which is not now recognized by the majority of Ontario farmers. We refer to wood ashes. Tons upon tons of these are shipped every year to the United States and there used by farmers who have learned to know their value. This should not be so. All of the ashes made on the farm should be carefully conserved, and wherever possible local sources such as flour mills and saw mills, etc., where much ashes is made, should be used to contribute to the supply of potash. It is a notable and encouraging fact, in this connection, that no crops respond more decidedly to potash stimulus than the legumes. Those crops which feed upon the nitrogen of the air are much aided in this activity by the use of potash fertilizers.

The question of the use of other artificial fertilizers to supply potash and phosphoric acid is a large one, and one which has to be determined largely by the individual agriculturist. Only by carefully conducted plot-experiments can the limits of profitable use of these fertilizers be decided for any particular farm or indeed for any particular field of a farm.

We have not discussed the question of the return to the land of most of what was taken from it in the form of farm-yard manure. Under the best possible system we are not *increasing* the fertility of our farms in this way though we may be *maintaining* it. We would not be misunderstood here. It is true we may add to the crop-producing power of a soil by many methods such as improving its mechanical condition by cultivation, drainage etc.; but thus converting *unavailable* plant food into an *available* form for the plant is not increasing fertility in the sense in which *adding* to the original store of plant food by the leguminous crops increases fertility.

Marvellous changes have been wrought in the crop-producing power of soils in numerous instances by the growth of clover supplemented by phosphoric acid and potash fertilizers. In soils possessing an abundance of these two latter constituents, clover-growing alone for the purposes of green-manuring has produced notable unquestionable effects.

It must not be concluded that results are hastily produced. Clover in the state in which it is turned under is not fit food for plants. It has to undergo many and complex changes before it is changed from the *unavailable* form to the *available*. But a discussion of the conditions necessary to those changes would lead to a thorough consideration of the operations of cultivation and drainage, and this is without the limits of our present purpose.

In the light of the facts above presented, some of which are the outcome of the latest scientific investigation, we may perhaps more intelligently consider the question suggested by the statement made by a practical farmer to which we at first made reference.

BORROWED WISDOM IN AGRICULTURE.

BY ROBERT C. BRANDON, CANNINGTON.

We do not insinuate that we as farmers have not many original ideas, aims and methods in conducting our business. The progress of our agricultural community in the past and at present is ample proof of a well directed application of energy and an intelligent perseverance which has to a very great extent been practically crowned with success. What we wish to speak on more definitely is the tendency of the age—the necessity of the hour.

Within twelve years agriculture has been completely revolutionized over the whole civilized earth. The causes have been numerous and the agencies most powerful and effective in bringing about this revolution, and we, the husbandmen of Canada, in the year of grace, 1893, find ourselves facing and fencing with the agricultural Philistines of many lands. Hence the necessity of only retaining and applying with practical determination all the good features in our own individual and national operations in regard to our line of industry, but to *imitate* if possible, *borrow* if permissible, and *steal* if compelled, the industrial wisdom which has been turned to financial success by our competitors who meet and with their product defeat us in foreign markets.

Our knowledge is the lever to action. Our wisdom is shown in knowing how to apply it. Here you will kindly pardon an illustration on this point:

The engine in a large planing factory became deranged in its operation. The local attendants failing to right it, an expert was called and in an incredibly short time put the mechanism in perfect working order. The result was 150 men were kept going without any loss of time. A bill was rendered which read, "To repairing engine $25.50, and it was promptly paid. In a few days the proprietor met the expert who asked if the engine kept right. "Yes" was the reply, "but your charge read very high." "No doubt, sir," responded the expert; "the real cost of work done on your engine was 50 cents, but I charged $25 for knowing how to do it." On reflection you will agree with me that our best efforts, no matter how vigorously we apply them, if not directed by a wise forethought is at best hap-hazard.

In the matter of borrowing wisdom we have this happy reflection that our Governments, both local and Dominion, are in full sympathy with us as an agricultural people, as their research over the different continents prove; witness the adoption of the best agricultural and horticultural products of foreign lands which can be produced successfully in our soil and climate. And as a people we should be proud of the distinction that the above institutions have attained, not only in America but over the whole earth. Then if our facilities for obtaining and utilizing knowledge are so favourably fixed not only through the experimental stations (and here, I might tell you that our own Station at Guelph has in the past year conducted no less than 25,000 different experiments), but also through the Farmers' Institute which is growing more popular and impressive every year, we have no chance left to plead ignorance of the best principles of action to adopt and the best branches of agricultural industry to pursue. But behind all these guards and fortifications thrown around by national institutions and the agricultural press—to use the historic remark of the old Admiral—"Canada expects every man to do his duty." "Ah," you say, "very good, but what is the duty? We will gladly perform it if the reward is at all adequate." We have had two rowed barley, the Canadian hen and turkey and the profits arising from the production and export of these things, together with protection to our native industries presented to us on one hand; we have free trade, commercial union and continental union presented to us on the other hand as the great panacea for farm depression. But aside from all these councils, the utility of which we have not as yet fully tested, though we believe some of them would be valuable if properly carried out, aside from the fostering care of our tutors and political parties, we are carrying a few stubborn facts which read: Wheat, 5 to 12 bush. per acre, 55 cts.; two-rowed barley, 20 bush. per acre, 25 to 35 cts. or no sale; Canadian barley, 20 bush., 35 to 40 cts.; oats, 30 bush. per acre, 25 to 27 cts. Here we are all in the same melancholy issue. True we have the taxes paid, and after a few threats we paid the interest

on the mortgage. Our hired help and store bills we will be able to pay, but not much left for our poor wives, and I who have worked very hard, have little left to minister to my own comfort or convenience. But you say: "Hold on. There you old pessimist; your ranks are full of croakers and you are just like the rest." Read this report from the special committee of enquiry on the agricultural depression:

To the Farmers of Brock and surrounding Townships:

We, your Committee after enquiry and due reflection, find, we are sorry to say, that most of our farmers are very careless in the prosecution of their industry, pinning their faith to the old methods of still growing many old and worthless varieties of cereals and this on poor cultivation, which makes matters lamentably worse. If they prepare live stock, cattle or hogs for the market, the output is so very meagre and thin, and the breeding so wretched, and the prices realized so disappointing, that this kind of production hardly covers expenses. These facts lead us to believe that our hog product was below paying prices in the autumn and winter of 1891 and 1892. These same facts lead us to believe that though beef cattle were not so active in price in the spring of 1892, the English embargo against the imaginative pleuro scare is not a valid reason for the farmers to drop the little bit of common sense enthusiasm which should inspire every man to keep lots of good stock and in fair condition. The boom in animal food produce at the present time is the proof of this. Before leaving this matter we wish to say that the summer months and not the winter months are the proper time for the selling of pork product as a rule, and that pork prepared for market by feeding barley and wheat would at the present time realize for the farmer at the ratio of 5 lb. of grain for one lb. of pork 75 cts a bushel for his barley and 95 cts. per bsh. for his wheat, which deduction is food for reflection in the future. We, your Committee wish also to offer a suggestion on the production of two-rowed barley. We find from market reports of the Mark Lane Express that good malting barleys were and are worth from 28 to 31 shillings and 6 pence per quarter of eight bushels would be from 70 to 90 cts. per bushel of 56 pounds. We regret to say that the failure of this enterprise has to a great extent been caused by bad management, as our product was not only injured in threshing but was unhappily mixed in all conditions of imperfections. As a proof of the feasibility of barley-growing for the English market, we have only to refer you to the success of the Hogg Bros. of our neighbouring village of Oakwood, men who have had many hundred acres grown on contract for the past two years, and we are happy to state they have carried out their contracts in a very creditable manner and pay their patrons 50 cts. per bushel for all that is grown. But in this case from harvesting until the final delivery, the commodity is handled in a business manner, and when inspected is not like the sample seen by the Hon. J. Dobson, of Lindsay, when in England lately, who said it was so broken and adulterated as to disgrace Canada.

In the matter of clover growing, we would advise every farmer who has the proper soil, clay or clay loam, fairly drained, to add this very important branch of farming to his general routine of crops, as the soil and climate in this Midland district appears especially adapted to this industry. To give an approximate idea of its significance as a factor in our financial accounts, I may state that one firm alone, Messrs. Shipman & Dawson, paid for clover in the year 1891-92 above $20,000 with a prospect of more than duplicating this trade in 1892-93. We would suggest that prime seed be only sown to keep up the quality and vitality of our product.

In the production of fancy and edible peas we would suggest that our farmers enquire into the matter, as there are considerable profits arising from this class of farming, and would refer enquirers to the extensive trade done in this line in the county of Prince Edward for American seed houses, and with the pleasant reflection that they pay 30 cents a bushel of import duty after paying the Canadian farmer for growing them. In conclusion, we recommend you as farmers to borrow and digest with diligence the many lessons of wisdom presented to us, not only from individuals but from national organizations and the agricultural press, and above all things read between the lines. We would briefly refer to some remarks made by Prof. Burnett on the improvement of our grain crops, given at the 13th annual meeting of the Experimental Union, Guelph. The professor very ably discussed the necessity of continued new varieties and the hybridizing methods of keeping our cereal crops up to our best wishes in perfection, and stating that an intellectual *bent* in this direction would be as profitable nationally as the energy bestowed on the improvement of our live stock.

HINTS ON HANDLING BEEFING STOCK.

BY JOHN MCMILLAN, M.P., OF CONSTANCE.

After an experience of nearly fifty years on a farm in the province, and after having been engaged for the last six years in assisting to hold Farmers' Institute meetings. I think I may be excused if I give a short article on what I believe has assisted to lead to the present depressed condition of the agricultural industry in Ontario. One cause has been the system of cropping and selling all the grain raised on the farm, which has so impoverished the soil that in many cases the crop raised will not pay the cost of production. Next raising a few young cattle and selling them to be made into beef by some one else. Another cause is that by the improved means of carrying freight of all kinds by railways and steamships, the most distant parts of the earth are enabled to send their surplus into the British markets, which has reduced the prices of grain lower than it has

been for over seventy years. In Great Britain in 1815 the price of wheat per quarter was 65s. 7d; in 1861 it was 55s. 4d.; in 1871, 56s. 8d.; in 1881, 45s. 4d; in 1892 it was 30s. 3d, the lowest since 1815 except 1889, when the average price was 29s. 9d., a price that will not pay the Ontario farmer. In this age of keen competition and low prices it becomes a serious question with the farmers of Canada which is the best course to pursue in order to maintain their position among the different nations in the markets of the world. I believe the time has arrived when the farmers of Ontario should not export any grain, but consume all they raise on the farm, and rather import coarse grains and feed them in order to increase the fertility of the soil. The majority of the farmers must turn their attention to raising stock for the purpose of supplying beef, mutton, butter and cheese as the principal articles of export. In changing from depending chiefly on grain raising to keeping cattle, a change in the system of breeding must take place.

No grade male animals should be used for breeding purposes. The old Canadian cattle have the advantage of hardiness, but they are not good feeders and do not arrive at maturity at so early an age as the modern pure breeds. But in crossing a superior breed upon the average stock of the farm, the best results can only be obtained by a better system of feeding and stabling than the original stock have been accustomed to. As a celebrated breeder has said, "With every improvement in blood a corresponding improvement in feeding and management must be made, or nature will surely thwart our plans by asserting her supremacy and adapting the animal to the conditions in which it is placed." But it is not necessary for a farmer who has common stock to put them away and purchase high bred, high priced stock. The chief points to be settled with the farmer is, what line of farming is he going to follow, and what breed of cattle is best fitted for the line he has laid out for himself. I have come to the conclusion that what the general farmer in Ontario wants is an animal that will give a fair quantity of milk, and from which he can raise steers that will make a good beef animal. I know of no breed that will fill the bill equal to the Shorthorns (Durhams) and their grades, when properly cared for; but they must not be turned out in cold winter weather to feed all day around a straw stack. As I have chosen the breeding and buying cattle, and feeding them for the British markets, I will say a few words about raising cattle for that purpose. The first and a very important point is to breed from no male except one that is pure-bred and belongs to a family that has formed the habit of maturing early and laying on beef rapidly. In buying a bull get one with a registered pedigree. The further back that the breeding of the animal can be traced in one unbroken line of descent from some celebrated family the stronger the prepotent power of the animal to transmit his own inherited characterestics to his offspring.

Besides a good pedigree I would also want a good animal, and, if possible, to ascertain the history of the breed to which it belongs. The bull should have a small muzzle with large nostrils broad between the eyes with a full, clear, mild eye; he should be almost straight from the tail root to the horns, except the neck a little arched, round in the barrel, full in the crops (that is behind the shoulder), long in the quarter, with the buttocks reaching well down to the hock, a full wide brisket, not too long in the body, low set, clean broad bone in the legs, with a tapering tail, soft curling hair with a fine mellow skin—a smooth, straight, broad animal, which if properly cared for and given plenty of exercise should improve common stock rapidly. The bull wants to be kept in good condition, but not two much loaded with fat. It is a mistake that too many have fallen into of late years to breed only from very young bulls. The custom with many is to buy and begin to breed from a young bull 12 or 14 months old and often to put him away at three years of age. No young, immature animal can transmit a strong hardy constitution to his offspring in the same manner that a well matured animal can. A bull is at his best from three to about ten years of age, if properly handled. In breeding for beef get the calves dropped any time from the month of January to the first of April; then they should be ready to put on the market at from two years to two years and six months old.

When the calf is dropped we feed from the pail new milk. Begin early to mix with a little boiled linseed meal. When about three weeks old begin to use the new

milk with a little skim milk warmed up to about eighty degrees. Teach them early to eat meal; two bushels of oats to one of peas ground with a little bran is good feed for calves, and when kept in a box and taken dry I have never known it to injure them. Give a little clover hay and a few cut roots of some kind. Get them to feed as early as possible and keep them growing and improving from the time they are dropped. They can be weaned when about seven weeks old, but give them all the peas and oats ground that they will eat for a length of time. When put out to grass do not put them in an open field with no shelter in hot weather; if there is no shelter put them in the house and feed during the day and put them out at night. Stable at night in the fall when cold, wet nights come on. Do not let them fall off before going into winter quarters, but feed them well and keep them growing. In putting to grass in the spring turn them out only for one or two hours at first, and feed them in the house for a few nights in order to prevent scouring. Always let cattle have plenty of salt when at the grass. Keep it in a box so that they have access to it at all times at least once each day. When fall comes the cattle we raise and those we buy are put into the stables in good time before very cold stormy weather comes on. In purchasing cattle to fatten never buy scrubs, as they are dear at any price. In putting cattle in and tying them, if they are a little wild and ugly never strike or kick them, but get a card or curry comb and curry them and they will soon become quiet. In beginning to feed when they are put in the stable if possible let the person that is to attend them until they are finished take charge from the first. Let the same individual feed the same animals all the time, for to be highly successful the animals must be used quietly and kindly, never exciting or irritating them. Feed them regularly at the same times every day, and also in the same rotation—that is the animal that is first fed, feed first every day, never feeding more than will be eaten clean in one and one-half hours, and still giving every animal all that it will eat up clean. A good, careful, kind herdsman is said to be worth one-seventh of the feed more than an ordinary individual. If an animal is struck or irritated it is said to practically cost three days' feed. The animals must have full confidence in the person that cares for them.

To show the difference between scrubs (or native cattle) and well bred grades: Mr. Britton, at one time a feeder of cattle in Toronto, gave a statement before the Agricultural Commission of an experiment that he made. He said: "In 1873 I bought 103 native cattle back of Peterboro'. They were three years old, and I thought I would try an experiment with them. I tied them in two rows and gave them all the hay they wanted three times a day. I also gave them corn and bran mixed. I put them up in November and fed them seven months. Next to them I put two rows which I bought near Goderich, all grades. I bought the first lot for 2½ cents per lb. and the others at 3½ cents to 3¾ cents, live weight. I also fed them seven months. The common cattle required more food, for they were always eating, and during the seven months all they gained in gross weight was 130 lb each. The grades gained 270 lb. each; they were about the same weights and the same age as the others. I sold the native cattle to the Americans for $4.63 per hundred pounds live weight, and I got $5.37½ for the grades." Here was an experiment that should count for something on account of the large number of animals of the different classes. The result was that Mr. Britton made a profit of $5.05 cents more per head on the grades than he did on the scrubs, although he paid over one cent per lb. live weight more for them, and the party that sold the grades as stockers got eleven dollars more per head than was paid for the native cattle. When sold the grades brought sixteen dollars per head more than the natives.

I will give one sample of what I have seen in the cattle market at Glasgow in Scotland. Standing along with two Canadian farmers in one of the sale booths we saw six steers sold. They would average about 1,325 lb. each—all grades, but a little on the rough side. The highest price was £16 10s. The next animal was a well-bred, round-ribbed, smooth, compact little beast that would weigh about 1,250 lbs., which was sold for £18 10s. Here were two pounds more money for an animal 75 lb. lighter in weight. The farmers can do nothing in raising the value of the products they put upon the market, but they can do a great deal in cheapening the cost of producing and improving the quality of the articles they produce. Even in the lowest markets really prime cattle will

always command a fair price. The export of Canadian cattle to the British markets has grown from 7,639 animals exported in 1877, to 120,309 in 1890, and 108,289 in 1891. In 1892, 98,755 were sent to Britain. We exported in all in 1892, 107,180 animals. Over 1,000 went to St. Pierre at $22 per head; 2,312 went to Newfoundland at nearly $34 per head. Such cattle at two or three years old never pay to raise. Not one single stock steer ought to leave Canada. They should all be fatted at home and sold only when fit for the butcher.

I am certain that I am within the mark when I say that in the province of Ontario alone there is a loss of at least $2,000,000 annually by the system of using scrub bulls and not caring properly for the cattle when young and growing. I was told at a farmers' institute meeting by a gentleman two years ago, that he bought cattle two-year old, rising three in the fall, for $16 and $17 per head. He fed them all winter and sold them for beef in the spring for $32 and $33 per head. There are over 700,000 cows in the province. There will be at least 400,000 calves raised. About 250,000 of these are bred from scrubs or grades and not properly cared for, upon which, when they come to two years old, there is a loss of at least $10 per head. The experiment that Mr. Britton made showed that the grades he fatted were sold for $16 per head more than the natives (or scrubs). Then as to milch cows, by proper breeding and selecting they can be made to give at least one-third more milk annually than they do at present. But I will say a word about dehorning and close.

Last year we dehorned 36 head of cattle on the 22nd of November. There is no doubt that the animal suffers a short pang when the horn is being taken off, but it is only momentary. A young man held his watch and told us that the first horn was taken off in 9 seconds from the time the saw touched the horn until it was completely severed from the animal's head. None of them seemed to suffer after the operation was over; some of them bled considerably, but nothing to injure. Before they were dehorned we had a few of them in a loose box, but the loose animals were always hooking the others. They were very restless before the horns were off. We put nineteen into a box 63x27, and they have remained loose all winter. They have done better than the others of the same lot fed in the same manner by the same person, only they are tied. The dehorned animals will pack into the feeding trough as close as a lot of sheep, they are very quiet; no hocking or horning now. We have only cleaned out the manure twice this winter and the cattle will keep cleaner with the same amount of bedding than when tied. The saving of labor is a considerable item. On the score of humanity, I am sure that the animals suffer less in a single winter, the danger of accidents to the caretaker is very much reduced, and the cattle look better and, I think, are much tamer after the horns are taken off. This is our first experiment, but we intend to dehorn again next fall; but I think it should be done in the fall just as soon as the flies are past when the cattle are on pasture. Now, after all that I have said, it is impossible to lay down any cast iron rule that all can be guided by, because every individual must be the judge of his own conditions. He should find out in the first place what are his own capabilities, and what course of farming is his land best suited for. I have said nothing about breeding and keeping a herd of pure-bred stock. While every farmer can improve his stock few are really capable of breeding successfully and making it pay. Besides, cattle raising, sheep raising and, I think, the raising and feeding of hogs, when gone about intelligently, will pay about as well as any branch of general farming.

SEED GRAIN.

BY JAMES DUNCAN, NEW HAMBURG.

In writing a paper on seed grain I will only touch on the parts that have come under my own observation and experience.

Before making an attempt to select your seed grain, you should consider what kinds of grain succeeds best in your own locality, and what would pay you best on your own farm, and also what condition your land is in. For instance, it would be folly to buy expen-

sive seeds to sow on a field that was full of noxious weeds, or on a field that was waterlogged, or where the soil is sick and is more in need of the agricultural physician than any kind of seed grain. The proper selection of seed is the master touch of a successful husbandman. In selecting seed grain the first point is to get clean seed and free from all manner of noxious weeds, such as wild oats, wild mustard, couch grass, cockle, chess and wild tares. All of the above will shell out on the land by the slightest touch and often by the sun and winds. I would ask any intelligent farmer if it is not both criminal and stupid to poison our virgin soil with such abominable rubbish. Just look at some of the fields in this province of ours, and a good many in our respective neighborhoods, which are nurseries from which the rest are poisoned. Those plagues brought upon us by our own negligence are often fought but seldom or ever completely conquered, and it would be well to bear in mind that "one year's seeding is nine years' weeding."

In the second place, your care should be to secure a plump, well-ripened berry. By doing so you will have a strong and vigorous plant, which will force itself forward, and a promising braird is in most of cases the forerunner of an abundant yield.

In the third place, I would recommend a change of seed, say from clay to sandy or gravelly, from gravelly to clay, and likewise from one locality to another. Why the change should be beneficial and increase the yield, I do not know, and can give no satisfactory reason, but it is a fact beyond dispute.

Fourthly, I would recommend that those buying seed grain should have some knowledge of the farm on which it grew, its soil, and if the owner is a reliable person and his farm and grain are as clean as his promises when you buy and pay for your grain In conclusion, I would say, sooner than sow filthy seed let your land go barren and posterity will sing your praises for wisdom and forethought.

THE ADVANTAGE OF A PARTIAL SYSTEM OF SOILING.

BY JOHN I. HOBSON, MOSBOROUGH.

As the quantity and quality of crops depend upon the fertility of the soil and the mode of cultivation, so does the successful breeding and feeding of the domestic animals of the farm depend in a large measure upon the quantity and quality of the food which the soil produces, along with a judicious and economical system of feeding.

The marked excellence so noticeable in the best breeds of horses, sheep and cattle has mainly been brought about in two ways—judicious selection of animals to breed from and liberal feeding coupled with careful treatment in other respects. There is but little use in studying up pedigrees and buying high-priced animals unless the farmer at the same time feeds liberally. There is no need at this day of enlarging upon the advantage it is to any farmer to have a correct knowledge of the art of feeding, or to say much about the influence of food in developing the valuable characteristics in the meat-producing and milk-giving animals of the farm. The principles of feeding as practised by our best stockmen is no more guess work, but are based on the correct laws of science.

It is well known by those who have had opportunities of closely observing the practice of the most successful breeders and feeders of this and other countries that it is considered of great importance not only that stock should be warm and comfortable in winter, and especially that they should be protected during the changeable weather of spring and fall, and that the largest profits are realized when they have a full supply of nutritious food during the whole year.

Now, if what has been stated is correct, it may be well to consider what is the best way of bringing about those desirable results, and my purpose is to try and show that soiling, when properly carried out, would be an important factor to that end, and would as well in these days of keen competition by greatly increasing the productiveness of the soil place the Canadian farmer in a better position for holding his own against the competitors of other lands.

I may here say that in dealing with any subjects at farmers' institute meetings I have been careful not to advocate any system which I have not in a greater or less degree practiced myself, or in other words have kept clear of what might be termed mere theory. I have noted carefully during the past ten or twelve years in all parts of Ontario the practice and the system followed by the most successful stockmen, and found that whenever a partial system of soiling has been practiced, that in all cases the results were most satisfactory, and in no case did any farmer speak of returning to the old plan of depending solely on pasture for summer feed. And it is to be borne in mind that the experience of these men is in accord with that of many of the most progressive farmers of other countries where agriculture occupies a leading position relatively with other industries. We find it carried out extensively in Germany and France, as well as by the most advanced farmers in the Eastern States. And those who, like the writer, have had opportunities of seeing what is done in Great Britain will know that it is almost the universal custom on the high priced lands near the towns and cities to feed the cows which supply these places with milk on the soiling system.

It may be still further said that any number of individual cases could be given establishing the position taken, that on the best class of tillable land in Ontario a partial system of soiling can be carried on with the most satisfactory results, and with largely-increased profits as compared with pasturing. We find it practiced by those men in the county of Oxford who every year make the largest averages for milk sent to the cheese factories. We saw the extraordinary results obtained by the late Mr. McKellar, of the Richmond Road, near Ottawa, from whose farm from eight to ten thousand dollars' worth milk was sent annually to the city of Ottawa ; and in every instance where we have seen a partial system of soiling judiciously followed (especially on dairy farms) the results have been highly satisfactory, clearly demonstrating that it is ever becoming a more important factor in the direction of cheaper production of meat and dairy products.

Now while there can be no manner of doubt as regards the advantages and profits under certain conditions, it is a question upon which there is plenty of room for difference of opinion as to what extent it could be carried on with profit on the average of the high priced and first-class tillable lands of this province. It would appear that the time is not far distant when on these lands, judging from what is now being done, the system will be very generally followed.

In dealing with this, like many other subjects pertaining to farming, many things have to be considered, for it does not by any means follow that a system of farming which is the best that could be followed on such lands as have been referred to, would also be the best on land worth from $10 to $20 an acre, or on a farm that was fit for little else than grazing.

Among the advantages to be considered, is the saving of land—for whether it is carried out as a general or a partial system, does not in any way affect the argument for or against. If, as is held by those who have long practiced it and who have carefully noted results, that one acre of soiling crops, will produce as much food as three acres (and some good authorities place it at four) in pasture, the saving will be just in proportion to the number of acres sown. My own experience leads me to know that the difference is quite as great as stated. If this is correct, it follows that for every acre used in growing soiling crops, two acres more are available for growing the other crops of the farm.

Another strong point in favor of a *general* system of soiling, is, that it does away in a large measure with the necessity of having fences ; however, as we advocate a partial system, the saving in this respect could not be counted on. It may be here said in this connection that the experience of most of our successful stockmen leads them to think that the stock when fed in the stables are all the better for being turned into the pastures at night, especially during the hot months, and certainly there are many things to be said in favor of doing so. Perhaps there is no way in which growing forage crops and feeding it in the stables or yards shows to better advantage then in raising calves. This class of stock should in all cases be kept in cool and darkened stables during the hot months of summer, and protected as well during the changeable weather of spring and fall. If allowed to run out during the hot weather the heat and annoyance from flies keep them in a constant state of uneasiness. These evils incident to pasturing are entirely removed

when kept in buildings suitable for the purpose. There is no need to speak of the much better shape they appear in at the end of the season, every one who knows anything about stock management has seen it for himself.

After having dealt with the question of soiling the ordinary stock of the farm, it may be well to consider whether a great deal more might not be done in the way of making beef in the summer, and fattening sheep and lambs in the fall. My own practice has been to go somewhat extensively into it for a number of years, and the results have been most satisfactory. Under proper management it can be so arranged that each of the soiling crops will come in at a time when it is of most value; and even in Ontario with our comparatively short summers a good deal can be done in the way of growing two crops in one season. Take rye sown in the fall upon land required for roots the following season, or for the later sown soiling crops, and a full cut can be obtained in time (that is, provided the soil is suitable for it) to re-sow and again have a fall crop. This is particularly the case when followed by rape. Clover comes in well after rye, taking a good place between it, and oats and peas mixed, or oats and tares. The last-mentioned I much prefer if the tares can be had free from mustard seed; and when grown care should be exercised so that the seed is not allowed to ripen, otherwise, it may be found difficult to get rid of (that is the tares). My own practice is to sow at intervals of about a week between the times of sowing; in this way the food is always used at its best. On dry and suitable soils lucerne is found to be a very valuable soiling crop. It draws heavily upon the plant food, and should be heavily manured. However, unless the land is well suited for it, it is better not to grow it; on damp soils it winter-kills badly. The value of corn for fall or winter feed is too well understood to require much to be said about it. It should never, however, form the whole ration, but should be fed in combination with other more nitrogenous food. When passed through the chaff cutter, green corn and well-cured clover hay makes an admirable food, not only for cattle, but for colts or young horses when not working. My own practice of late has been to do a good deal in that way of feeding colts in the fall, and I find it preferable to allowing them to run in the pastures. There is so much written and said about how to grow corn that it would appear to be almost needless to say any more about it. The question of what is the best width in the rows is about settled: the consensus of opinion appears to be in favour of from three feet to three feet six, and the plants in the rows from four to six inches. That no doubt is all right for fall feeding when passed through the chaff cutter, but when it is drawn to a grass field and fed uncut, either from lack of education, or for some other cause my stock invariably leave a large part of the thick stalks, and for that reason what little has been fed in that way of late years has been grown with the plants much closer together in the rows.

One of the greatest benefits to be derived from soiling is the large increase in the manure supply. By this system, all that is made is saved and can be applied to the land in the best form, whereas all the droppings on pasture is in a great measure wasted, if from no other cause by these droppings destroying nearly as much feed as they produce by the additional enrichment. When soiling is practised to any considerable extent, it is safe to say that the extra amount realized from the increased quantity and the high quality of the manure, is enough and more than enough to meet all the additional expense of cutting, hauling and feeding.

Another important consideration is that soiling will, if properly managed, clear the foulest land of every noxious weed. This may be set down as a very strong point in favour of the system. Tens of thousands of acres of the most fertile land in Ontario are comparatively worthless, from no other cause than that the ox-eye daisy, mustard, wild oats, thistles and every noxious weed occupy the soil to such an extent that there is hardly room left to raise crops sufficiently remunerative to pay for the labor.

When a system of soiling is carried out intelligently, weeds are not allowed to mature, and as a consequence it is but a short time until the land becomes perfectly clean.

While much may be said in favor of a partial system of soiling, hardly anything can be said against it unless exception is taken to increased cost of labor. That is a question each man must work out for himself. A common sense way of looking at it is: Will that labor yield a profit? There appears to be no good reason why any farmer should object to pay for extra labor if it is found there is a profit in it. It is not often that

a man becomes rich from work actually performed with his own hands; more generally it is on profits derived from money judiciously expended in labor or otherwise. The observation of years has only confirmed me more strongly in the belief that the farmer who succeeds best is generally the one who farms liberally. Labor may often be performed and money expended for what may give no immediate returns, and many a farmer fails through not looking far enough ahead. There is a great deal of work often left undone on a farm which had it been performed, would after having paid its cost have left a large margin for profit. We farmers are a little too apt to confine our operations to that from which we expect immediate returns.

To sum up, it may be claimed in favor of soiling, that stock would be more comfortable. That when reared for beef the greatest weight could be obtained in the shortest time and at the least cost. That looking at it from the dairyman's standpoint, the gain would be even greater than on a farm where beef and mutton were the chief products—greater for the reason that the cow requires less exercise than almost any other domestic animal. There would be a large increase in the quantity and quality of manure, adding largely to the productiveness of the soil.

There would also be an increase in the acreage available for growing grain and hay to the extent of at least two acres added for every one used in growing soiling crops.

As already said, what would appear to be the proper line to follow on the ordinary fairly tillable farm would be to carry out a mixed system of pasturing and soiling, whether the lines be breeding, fattening or dairying. There is a richness about the grasses in early summer, continuing on into June, which will produce results that cannot be surpassed by any soiling crop grown. And besides that there are on most farms portions which cannot be used to such good advantage in any other way as for pasture. But from the time the pastures become somewhat dry and scanty, there is at once a noticeable falling off in the flow of milk, a check on the rapid growth of the young animals, and a slower rate at which meat is being laid on by the fattening stock. It is from this time forward until winter sets in, that the scanty pasture should be supplemented by a full and liberal supply of meat and milk producing food.

If a change in this direction was to take place generally all over our province, farmers individually would be enriched, our farms would yield more bountifully, the money lenders would have to seek other channels for investments, and our national resources would be annually increased to a very large amount.

FERTILIZERS ON THE FARM.

BY F. G. H. PATTISON, GRIMSBY.

This subject is one of great importance to us farmers at the present time; for he who solves the problem of increasing the fertility of our farms, whilst at the same time making a good profit from their products, will confer a great benefit upon us, and will deserve to be ranked in the same class with him who makes two blades of grass to grow where only one grew before. Many attempts are being made to solve this problem. Some claim that they have already solved it; but whether truly or not time alone can show. One man says clover will do it, another the feeding of fat cattle for the British market, another the feding of milch cows and the sale of butter therefrom, another the feeding of sheep and lambs; whilst a few pin their faith upon what are termed commercial fertilizers. It is some of these latter that I wish to touch upon in this paper. And here I would say that as regards the modes of increasing the fertility of our land already mentioned, ordinary farmers will probably effect more if they adopt a combination of two or more of these plans, than if they rely upon one only. No doubt, if we could all obtain barnyard manure in unlimited quantity and of just the right quality at our doors, the problem would be solved and we need go no further. For I am a firm believer in the vir-

tues of barnyard manure, and I think that there is nothing like it, if produced at a reasonable cost. But it will scarcely do for the farmer to incur a heavy loss on—say feeding cattle—in order to procure manure, and where it is purchased out and out, it is too often found that by this means noxious weeds are introduced on the farm, to get rid of which afterwards, takes much time, labor and money. Therefore, if we can make a profit by the judicious use of commercial fertilizers, by all means let us go ahead; only let us be careful that we use the combinations specially adapted to our particular farms, and that we can only find out by careful experiment. For it is not sufficient with commercial fertilizers simply to purchase and apply them, leaving them to do the rest without any further thought upon our part, reminding one of the advertisement of an undertaking firm in the West which ran as follows: "You kick the bucket, we do the rest."

Personally I have been experimenting for some time past with the various ingredients that go to make up what is termed "a complete commercial fertilizer," and I cannot agree with the conclusion arrived at by some that there is no profit to be derived from their use, whilst I have seldom found any profit from the use of the complete fertilizer itself as obtained from the manufacturers. We farmers have to pay through the nose for the combination of the various ingredients which make up this complete fertilizer, which is, after all frequently unsuitable to our soil, often containing an excess of what the land does not lack, and too little of what it really needs. Moreover, it does not require a large knowledge of agricultural chemistry for the farmer to obtain the different ingredients for himself, mix them in whatever proportions he desires, and then become his own fertilizer manufacturer to some extent. Personally I have seen good and profitable results from the application of superphosphate of lime, wood ashes, ground bone, sulphate of potash, sulphate of ammonia and nitrate of soda in certain combinations, but seldom by the use of any of these separately. And again I have failed to get profitable results from other combinations of the same ingredients. But it is by mistakes that we learn, and he who is too cautious ever to commit a mistake will never amount to much in farming or indeed any other pursuit. By pursuing this course, however, I am finding out just what my soil needs and am consequently obtaining better results therefrom every year. Now I had the honor to address the members of the Institute two years ago at Jordan, when I declared my intention of experimenting with nitrate of soda and laying the results before you. Some of these with your permission, I will give you to-day. These experiments have been chiefly with oats and also indirectly with fall wheat. I have also used it upon tomatoes which derived great benefit from its application during the season of 1891—and potatoes, in which case it was not quite so successful; but I have no exact figures to lay before you as in the case of the grains referred to. In the spring of 1891, I dressed four acres of oats with 200 lb. nitrate of soda and 200 lb. superphosphate of lime. The nitrate cost me $57 per ton and the superphosphate, $18 per ton, being a total cost of $7.50 per acre. That spring, as no doubt you all remember, was so remarkably dry, as to be a very unfavorable one for the trial of any fertilizer, since nothing of the kind can produce much effect without some rain to carry it to the roots of the plants, and that year no rain came with us till the season was very far advanced. However, the oats which received the application referred to yielded 26 bushels per acre, whilst those in an adjoining field of similar soil and sown at the same time yielded only 18; the first also yielded about a quarter of a ton more straw to the acre: in all other respects the two fields received exactly the same treatment. There was thus 8 bushels of grain and a quarter of a ton of straw per acre in favor of the fertilizer, which, taking oats at 20c. per bushel and straw at $4 per ton, would amount to $3.40 per acre, whilst the fertilizer cost $7.50 per acre, rather a disappointing result you will say, and so I thought at the time. But just wait a little.

In the fall of 1891 the whole field of 14 acres was sown to fall wheat, 5 acres of which were fallow, manured at the rate of 15 loads per acre of barnyard manure, 5 of pea stubble worked up with a disc harrow, and the 4 acres of oat stubble referred to, which was plowed shallow late in September. The fallow was sown on the 12th September, the pea stubble on the 17th, and the oat stubble on the 1st of October, 1891. The two former had a fair amount of top before winter set in, the latter you could scarcely see, the same being the case when spring opened in 1892; but when the

crop was harvested and threshed, the oat stubble yielded 23 bushels per acre of wheat, the pea stubble 16 and the fallow 15, the whole field averaging 18 ; there was also half a ton per acre more straw from the oat stubble. Taking wheat at 70c. per bushel and straw at $3 per ton, we have a difference of $6.40 per acre in favor of the portion dressed with fertilizer the previous season, making with the $3.40 per acre of the preceding year, a total of $9.80 per acre—spread over two years it is true—from an outlay of $7.50, thus giving a profit of $2.30 from the application. This last season of 1892 I sowed a field of 9½ acres to oats, 3 acres of which I dressed with 200 lb of nitrate of soda and 200 lb. of superphosphate of lime to the acre at a cost of $7.50. The spring was the very opposite of the previous one, being abnormally dry The fertilized portion yielded 43 bushels per acre, that with no fertilizer 23, the former also yielding 1 ton more straw to the acre. Thus in a single season, taking oats at 30c. and straw at $4 per ton. the fertilized portion yielded $10 more per acre than the unfertilized at a cost of $7.50, giving a profit of $2 50 per acre, and probably the crop of 1893 will benefit to some extent from the application. I hope to continue these and other experiments in the future. So far as I have gone the trials would seem to indicate a profit to be obtainable from the application of the mixture referred to. I also applied the same mixture to some of my fruit trees, leaving others non-fertilized; the difference was quite noticeable, both in the size and quality of the fruit, and also in the appearance of the foliage and of the trees generally. I would therefore say regarding nitrate of soda, that whilst not in my case producing the marvellous results claimed for it by some, still its application seems to leave a fair margin for profit, even when prices of grain are as low as they are to-day. I should like to see some other farmers take this up and experiment for themselves, going slowly at first, of course, so as not to risk any great pecuniary loss ; for it is by experimenting for ourselves only that we farmers can really find out the truth about fertilizers. The results differ so much on different kinds of soil and in different localities, that experiment stations cannot do a great deal to help us except by detecting worthless preparations.

AGRICULTURE AND TILE DRAINING.

BY FRED. ARNOLD, KENTBRIDGE.

Without agriculture men would live wandering and unsettled lives, disputing with each other for the possession of such animals as they could make their prey, and also for the spontaneous fruits of the earth. They would have no bond of society or of country. In regard to the importance of agriculture, it may appear out of place in me, to address you. That art on which all mankind are depending for their very sustenance, in the prosecution of which nine-tenths of the fixed capital of all civilized nations is embarked, and probably two hundred million men expend daily toil—that art must confessedly be the most important of all arts, in every country and in every period. The investigation of the principle on which the rational practise of this art is founded ought to command the undivided attention of great minds. To what other object could they be more beneficially directed or more honorably employed ?

Having briefly noticed the vast importance of this subject, and hoping not to weary your patience with lengthy researches of the many branches of the great art into which it may be divided, I will select some one branch of the art of culture for especial illustration, and as tile draining and its effects are at present under consideration by many of our best agriculturists, I will endeavor to observe some of the effects of the mechanical changes it produces.

Draining and its Effects. Among the merely mechanical methods, by which these changes are to be produced upon the soil that are to fit it for the better growth of valuable crops, draining is now allowed to hold the first place.

That it is an important step on heavy clay lands, and it must be the first step in all cases where water abounds in the surface soil, will be readily conceded ; but that is

can also be beneficial in situations where the soils are of sandy nature, where the sub-soil is light and porous, or where the inclination of the fields appears sufficient to allow ready escape to the water, does not seem so evident and is not unfrequently a matter of considerable doubt and difficulty. It may be useful, then, to state briefly the several effects which in different localities are likely to follow an efficient drainage of the land:

It carries off all stagnant water and gives a ready escape to what falls in rain.

It arrests the ascent of water from beneath, whether by capillary action or by the force of springs, and therefore not only preserves the surface soil from undue moisture, but also frees the sub-soil from the lingering presence of those noxious substances which in undrained land so frequently lodge in it and impair the growth of deep-rooted plants.

It allows the rain instead of merely running over and often injuriously washing the surface, to make its way easily through the soil. Thus while filtering through, not only does the rain-water impart to the soil those substances useful to vegetation, but it washes out of the upper soil and when the drains are deep enough, out of the sub-soil also, such noxious substances as naturally collect and may have been long accumulating there, rendering it unsound and hurtful to the roots. The latter is one of those benefits which gradually follow the draining of land. When once thoroughly effected it constitutes a most important, permanent improvement, and one which can be fully produced by no other available means. It will be permanent, however, only so long as the drains are kept in good condition.

This constant descent of water through the soil causes a similar constant descent of fresh air through its pores from the surface to the depth of the drains. When the rain falls it enters the soil and more or less completely displaces the air which is constantly within its pores. This air either descends to the drains or rises in the atmosphere. When the rain ceases, the water as it sinks again leaves the pores of the upper soil open and fresh air consequently passes down to the drains. Thus when a good drainage exists not only is the land refreshed by every shower that falls, not only does it derive from the rain those important substances which occasionally at least, are brought down by rain from the atmosphere and which are in a great measure lost where the water must flow over the surface, but it is supplied also, with a renewed accession of fresh air which experience has shown to be so valuable in promoting the healthy growth of all our cultivated crops.

But other consequences of great practical importance follow from these immediate effects. When thus readily freed from the constant presence of water the soil gradually becomes drier, sweeter and more friable. The hard lumps of the stiff clay lands more or less disappear. They crumble more freely, offer less resistance to the plow and are in consequence more easily and economically worked. These are practical benefits equivalent to change of soil, which only the farmer of stubborn clay lands can adequately appreciate.

But on lands of every kind this removal of the superfluous water is productive of another practical benefit and in its consequences is equivalent to an actual deepening of the soil.

When land on which the surface water is in the habit of resting becomes dry enough to admit the labors of the husbandman, it is still found to be wet beneath, and the water even in dry seasons not unfrequently remains where the roots of the crops would otherwise be inclined to go; or if the surface soil permits a ready passage to the rain, and water lingers only in the moist sub-soil, though the farmer may not be delayed in his labors, the sub-soil repels the approach of the roots of the grain and forces them to seek their nourishment from the surface soil only.

Still these are not all the benefits to be derived from an efficient drainage. When land is well underlaid with tile, open ditches and water furrows can be readily dispensed with, and not only render more land accessible to the plow, but gives a smooth surface to the agricultural implements, which otherwise suffer much injury and retarded motion, and in many cases render the industry of the faithful agriculturist doubly expensive.

When land is thus made level by the advantage of tile and also been made permeable to water by its constant drainage through its many cavities which the tile main-

tain, then when the rain descends, which falls equally over the surface of the hills, it passes immediately down through the earth taking in after it air and ammonia which it brings down from the atmosphere.

Water being the universal solvent of the earth and containing in solution all the properties that constitute the plants, it diffuses them equally through the earth and a regularity of plants is therefore productive.

In conclusion, I have only to add that to the skilful and intelligent farmer who applies every available means to the successful prosecution of his art the promise holds good even in our age and country that seed time and harvest shall ever fail.

THE LESSONS OF THE YEAR FROM TWO POINTS OF VIEW: AGRICULTURAL AND NATIONAL.

BY RICHARD STUTT, FOREST.

No part of a country is so valuable as its citizens. Anything that will improve them is very important. The higher the agriculture, the higher the point to which civilization can reach. Our Agricultural College and Experimental Farm has been of great benefit to us. The bulletins are full of valuable information which no farmer can afford to do without. The addresses by the students and professors at our institutes every farmer should hear. All our knowledge is the result of experimentation through many years. The first lesson of the year to the farmer is a plain one—we must increase the productiveness and lessen the cost of production. To that end we must raise less wheat. We know it does not pay when its market value is less than its cost. We keep on sowing with something of the gambler's trust "the turn of luck," and hope that by some favoring conditons we will reap more than we have any right to expect; or that some great failure in some part of the world will so advance prices that our crop will give some profit. Wheat is grown now in so many countries in such immense areas, on such cheap land, and in Russia, India and Egypt by such low wages, that we cannot hope to compete. In Manitoba the area of land under wheat has been increased over one hundred per cent. in four years. Say we average wheat at twenty bushels per acre. I am sure this is too high. But take it at that, 20 bushels at 60 cents is $12. How will that pay for plowing, say only once, harrowing, rolling, cost of seed, drilling, shovelling, harvesting, threshing, cleaning, and hauling to market. Then there is interest or rent of land.

There is also another important cost that we do not take into account as we ought, namely the value of the plant food sold with the wheat. Sell this off and what is the land good for but to wear the life out of the farmer. A bushel of wheat takes about 20 cents worth of plant food, or at 20 bushels per acre $4. A farmer is not farming right unless he returns this in some form. If this is not done sooner or later, it means exhausted soil. Cut down the area sown, one-half. Put the manure intended for the whole on the half. Then if the price is low we will be better prepared to meet it. Cultivate less and better should be our aim.

Next sow clover and plow down after the first crop. If left it will likely heave out and be lost to the soil. Sir John Bennett Lawes, of Rothamstead, tells us the roots are larger and have more nitrogen or plant food after the seed is cut than before. A little observation will show that he is right. Cut the hay for soiling or crop about the 16th June, or pasture to that date and you will have no clover midge. Science has discovered that much for us. If clovering is not done, I care not how it is, the land is becoming poorer. The rate of exhaustion depends on the amount of grain sold Simply puting back the straw, hay, and a part of the grain is not enough, as much must go back as is taken off. Without clovering no farmer can keep his soil fertile unless he buys fertilizers, and that will not pay here. But says one: "What are we to do for a cash crop as barley won't pay at 40 cents?" Our pork, lambs, sheep, cattle and dairy must be our cash crop.

All kinds of meat are a good price and we can produce it more cheaply. We have a grand country for growing all kinds of fodder corn upon which I think cattle will fat faster than on hay. Put in with the drill not so thick that the sun cannot get in, say a grain to every six to nine inches, cultivate the same as if for crop and the question of cattle feed is disposed of. Even if the land is poor and hard give it more scuffling, it will respond in a wonderful manner. The sooner we get silos the better. On account of our superior soil pasture and climatic conditions for growing fodder corn, they cannot raise cattle as cheap in the east as we can. The average yield at the Experimental Farm, Ottawa, was 21 tons 1,154 per acre. We can beat Ottawa. Mangels can be grown here to perfection. Store hogs can be kept all winter on raw mangels and come out fat. A little meal is a help, but they will do well without, given of course a warm place. This is not a theory. I have kept them mainly on mangels for years, and I am keeping them now. Hens will lay better if mangels is a part of their feed; just given raw will do. I feed a pailful every day to 130 hens.

From fifteen to twenty tons per acre is a fair crop but under good conditions much more can be grown. The average grown at the Experimental in 1890 was 36 tons 31 lb. per acre. Every farmer should aim at cheap feed—that is the largest quantity from the smallest area. Every farmer should aim at getting rid of scrub cattle. The lesson of the year in the scheduling of our cattle may turn out a blessing in disguise if it cleans out scrubs. If one cannot buy a stock of first rate cows he can keep his best and breed up, forever keeping away from that abomination a fifty cent bull. The scrub is the miserable result of misused opportunities, illustrated as a living example in the flesh to remind the world of its folly.

There is one fact concerning our barley which ought to be known. We know that there is a good deal of two rowed barley in our grain. American dealers are refusing to buy our barley on that account. I know a dealer who has many bushels of Lambton barley in Buffalo. It was sold long ago at a fair profit, but upon test, finding it mixed with two rowed, the buyers refused to take it, being unfit for their business. It is lying there unsold now. Six rowed will steep in 56 to 60 hours. Two rowed takes 90 hours, Six rowed will grow in six or seven days. Two rowed in ten to twelve sometimes fourteen days. The grains that do not grow become sour and subject to fungoid growths, are not only a total loss, but a serious damage. The Agricultural Farm or some responsible dealer would do good to offer clean seed. There is hope that the McKinley tariff will be off before our next crop. It is important that our barley should be such as would command the best price and keep up our reputation. Malt is largely used in the States as cattle feed. But our tax of two cents per pound prevents the use of it for that purpose here. Malt is nitrogenous. It makes heat It is a good concentrated food for finishing cattle in the winter, for the early market. It gives a fine flavor and produces the mixed fat and lean, so much in demand. Davies & Co, pork packers, Toronto, tell us they will give more for hogs that are long, meaty, but not too fat. Our old fashioned pork four inches thick of white fat, will not fetch the higest price in the English market. That market won't change to suit us; we must change to suit it. They recommend the Tamworths and Berkshires.

But I think our greatest item of loss is manure. Very few have manure sheds. It is generally wheeled out of doors. If there are no foul seeds such as wild oats the manure should go out as made. It will never get richer but if left out until spring or fall much poorer. If clover is sown regularly harmless weeds will soon wear out. If manure is put on now on plowed lands it ensures a good catch of seed and helps the crop. A wood shod sleigh will take it out almost any time when frost is in. If put outdoors now, sandwiched in between snowfalls just in the right shape to leach it, then in spring rained on and power pressed with the cattles' feet, there is little left but the residuum. Next summer the manure waggon will be just drawing to the fields the "dead body whose spirit has departed." If one cannot put it out now we can round up that the rain may run off without leaching the whole of it.

Another lesson is that farmers should be very careful how they follow the advice of men who are not living by farming, so that one may be able to overcome all our drawbacks and make money. Such as "Grow two rowed barley weighing 54 to 56 lb."

"Grow very large eggs for English market." "Raise cavalry and coach horses," etc., etc. The lessons of the year have buried these illusions—all but the undertaker's bill. Farmers must think for themselves. In the opinion of some that is hardly the right thing.

One thought more. Farmers should attend these conventions. Professors are sent here to give information and lectures. And not only so, but union is strength. There is a great deal to learn in agriculture. When a man gets to the point where he can't learn any more he had better "shuffle of this mortal coil" and go to a happier clime. Mere physical strength alone will not do for the future. The coming farmer shall bring mental power and the resources of science to bear on every branch of his business. It is only by education that the exhaustion of the soil in this country, and which has almost depopulated the once fertile New England States, can be prevented.

THE CREAMER, SEPARATOR AND BABCOCK TEST.

BY A. D. HARKNESS, IRENA.

Years ago, before dairying had become so important a branch of agriculture as it is now, we kept a number of cows and made up the butter at home with the shallow pan system of raising the cream. One day an agent came along with the Champion creamer and wanted us to buy one, but before we would buy, we wanted to try it first. So after weighing the milk and setting in the pans and weighing the butter for a few days, and then doing the same with the creamer, we found that the creamer gave us the best results, so we got an eight can creamer and have used them ever since, until a short time ago.

For two or three years we have thought that we did not get all the butter out of the milk, so last spring we got the little machine known as the Babcock tester, that will make the factory patron honest, whether he will be or not. We got it for two purposes, that is, to find out if we were leaving any butter in the skim milk and how much, and also to see which of our cows were the best and which the poorest, as every man who keeps cows ought to know. It is not a very difficult matter to find out how much milk a cow gives in a year, and with the Babcock tester it is an easy thing to know how rich the milk is; so when you have the quantity and the quality of the milk, you know just what your cow is worth, and by knowing the amount of food she consumes, you are enabled to tell whether she is paying for her keep or not.

I might say here that my method of keeping the record is to weigh the milk from each cow separately every tenth day, the two milkings, for the whole season, and then multiply the amount by ten, and that will give you the season's milk. This may not be absolutely correct, but it is near enough for all practical purposes. For the testing I test each cow's milk every thirtieth day for six tests, that makes it for the first six months after calving, and it is when there is the greatest flow of milk; besides I find that the cows vary more after they have milked eight or nine months (and no cow should milk less then ten months in a year) than they do in the earlier part of the season.

After getting the tester last spring we made a number of tests during the season, and we find that the older the cows were in milk, the more butter we left in the skim-milk.

We were always careful in setting the milk in the creamer, that is we never would let it stand in the yard to get cold, but just as soon as we would have enough to fill a can (about 40 lb) it would be strained, so it seldom got as low as 90° and never below that. About the 1st of November we tried some experiments with the milk. The first was to take the skim milk and heat it up to 95° and rennet it. Another was to add warm water to the whole milk and then set it, but we got no better results. During the fall we always let our milk stand 24 hours, since the water would be as cold as ice could make it. At this time we were losing about $1\frac{3}{4}$ per cent. of the butter-fat and our milk tested about $4\frac{3}{4}$ per cent butter-fat. We thought that was too much to lose, so we got a No. 7 Alexandra separator, the largest sized hand machine with a capacity of 550 lb milk per hour; it can also be run by power.

I will give some of the tests I made during the season on the skim milk from the creamer :

June averaged	4-10	per cent. of	one pound,	or 4	lb. butter to the	1,000 lb. skim milk.
July "	5-10	"	"	5	"	1,000 "
Oct. and Nov. 1	7-10	"	"	17	"	1,000 "

About Christmas time I got some skim milk from shallow setting from Peter Harkness, and tested it, and the two different samples from two different skimmings gave each 1 4-5 per cent. Just at the time I got the separator I made some tests of the creamer skim and the separator skim with the following results : Creamer skim from 1 3-5 per cent. to 2 per cent. butter fat ; separator skim from 1-20 per cent. to 1-10 per cent. But the proof of the pudding is in the eating, not in chewing the string. Now for the proof.

The day before I got the separator I kept the skim milk from the creamer and had 290 lb of it. I put this through the separator and kept the cream from it by itself, and churned it, and made 4½ lb of good butter. So you see the separator and the Babcock tester agree.

The catalogue prices of the separator are $150, and the No. 8 is $110 cash ; it has a capacity of 250 lb per hour. The No 7 is too heavy for a person to turn it any length of time, but for 200 or 250 lb. a person won't mind it ; but they say the No. 8 turns quite easily.

From 1,171 lb. of our milk this year we have made 67½ lb milk, or a lb. of butter for every 17⅓ lb of milk, 5 4-5 lb butter in every 100 lb. of milk. That includes the milk up to the 11th, and it is mostly from fresh milch cows.

I might say a word about the Babcock tester. It is of great value to the farmer if he will only use it, because by its use he can tell which of his cows are good and which are not. Now for an example of its value : We had two cows last season that gave us 4,495 lb and 5,030 lb respectively. These cows gave according to the Babcock test, 5 per cent and 3 per cent of butter-fat. The first will make 224 lb. butter, while the second which gave a little more milk, will only make 150 lb. Taking this at the price we received for our butter during the season, 21 cents, the first will give $47.00 and 2nd $32.50, or a difference of $14.50 in favor of the cow giving the least milk. Without the tester we would not have known which cow was worth the most to us.

DAIRY FARMING.

BY WALTER CARLAW, WARKWORTH.

The fact of "dairy farming" being more profitable than "grain farming" is pretty well recognized in nearly all parts of Ontario. For fear of there being any misconception as to the meaning of dairy farming I would give this definition. Dairy farming consists in having the dairy the principal feature of the farm, and making all other branches adjuncts to this ; or you may consider it as special farming if you so desire.

As all prospects of selling grain at a remunerative price at present have vanished, the farmer must of necessity direct his attention into some other channel, and dairying appears to be the branch that is most consistent with our circumstances in this particular locality.

The demand of consumers throughout the world to-day is for concentrated value and quality, and to meet this growing demand we must exert our energies in the line of manufacturing instead of selling the raw material as has been done in the past, much to the detriment of the fertility of our farms.

One of the great secrets of success in farming is selling articles that do not tend to impoverish the land. We find that the farmer in selling at average market rates disposes of the following :

In 200 bushels of wheat	he sells	$48.00	worth	of manured	constituents.
" $200 worth of hay	"	49.00	"	"	"
" 200 " cheese	"	18.00	"	"	"
" 200 " beef	"	17.00	"	"	"
A horse at maturity	"	7.08	"	"	"
In $200 worth of butter	"	only 25	"	"	"

The foregoing shows that out of all the products sold off the farm butter is the most economical article.

The farmer who sells all the grain off the farm is selling his farm, not inch by inch, but acre by acre ; yes, selling his farm and selling himself. You no doubt have heard of people being "sold." When you have sold your grain you have sold yourself, and you have been badly sold too. Is there any known or unknown method by which the farmer can take from the field a portion of it and leave it as fruitful as before ? Can he take the mineral constituents out of the soil and transpose them, and trust that some miracle of nature will replace them ? Here is where science plays no unimportant part.

We, as agriculturists, need more knowledge, more originality, more vigilance, than any other class of people. In order to be successful in any branch of agriculture you must have decision of purpose. Good results are obtained only by hard work, close observation, and persistent application. The farmer must understand the machinery as it were, whereby he converts the raw material into finished goods. There is a somewhat true saying that everything that is sold off the farm should be able to walk off itself ; but there are exceptions to all rules, as I believe cheese is not of the best quality when it is capable of walking off itself.

We should endeavor to supply material of a high value according to its weight. For instance : You might sell a ton of hay for $8, while a ton of cheese would probably bring $160 ; but the cost of transportation of the cheese would be about $\frac{1}{20}$ of the cost of the hay according to its value.

Who are the farmers that are crying out about hard times ? Is it those who have been feeding stock since boyhood or is it those who have been selling the grain off the farm all their lives ? Where are the moneyed men among the farmers to-day, even in this vicinity ? Is it not those who have made their money from stock ?

Prof. Robertson says "The largest returns with the smallest expenditure of labor, money, and fertility are to be obtained only from the best animals, fed on the best food, by the best men." We must meet the strong competition with better articles for transport, keep better stock, till the land better, or, in other words, farm more scientifically.

There are a great many advantages to be derived from co-operation in its various forms that I need not enumerate here. Make a speciaity of every branch of your industry and give each member of your family an interest in one thing or another, and provide the best literature on each and every subject of your occupation.

In considering progressive dairy farming I wish to sketch briefly the farm, cows, buildings, and last, but not least, the man.

The Farm. The farm should be well drained either naturally or artificially. A good dairy farm is generally found to be rolling. Land should not be too heavy or too light. Most of the farms in this vicinity appear to be very well adapted to dairy farming.

Cows. If cows are to be bought for the dairy, mention of a few points of excellence, may not be out of place. In general outline a good dairy cow should be rather (1) fine in the head and neck ; (2) wide in the chest ; (3) large in the barrel ; (4) large developments in the hind quarters. She should be a fair size and possess a coat of soft hair. The triple wedge shape in the dairy animal is considered essential. It implies (1) increasing width from the withers downward ; (2) increasing width towards the rear

parts; (3) decreasing width from the top of the hind quarters downwards. Other desirable features are tortuous milk veins, a well developed udder, a waxy horn, a fiery eye, a slim tail, etc.

Feed. Where the silo is used during the winter, soiling crops are essential during the summer and fall. These may be fall rye, oats and peas, or oats, peas and vetches, lucerne, and later on millet, corn and turnips may be used.

Care. (1) They should have plenty of good food at all times, as profit is only found in the amount of food given over and above what it takes to maintain the animal; (2) They should have access to water and salt at will; (3) In winter they should have sufficiently warm stables to ensure comfort. Cows should never be out of doors when it is too cold for the farmer to go about in his shirt sleeves. In regard to the milking season they should come in in the fall, as better calves can be reared in the winter than in the summer and the cows can be kept giving a large flow of milk during the whole winter season if succulent food is supplied.

The first step to be taken in the improvement of our cows is to find out how unprofitable the old plan of dairying is by keeping a record of each and every cow in the herd. This may be easily done by getting a spring balance and hanging it in the stable, and as each cow is milked hang the pail on the hook an register the weight. The second step is to invest in a Babcock tester and a pair of scales capable of weighing stock. Always use a thoroughbred bull of some dairy type.

Dairy Buildings. These need not of necessity be expensive, but should be constructed with a view to comfort, compactness and convenience, with every device for saving the manure. The stable should have plenty of ventilation, but must not be ventilated with the thermometer at zero, for then the cows do not enjoy the ventilation.

The Man. The man, in order to be successful must like cows in every shape or form, must be ambitious, enthusiastic and always willing to learn, and should try to be more than the average dairyman.

By improving the practice of dairy farming, and putting into it more enthusiasm, we will make our nation what it ought to be, a nation of prosperous dairy farmers from the Pacific to the Atlantic.

THE CORN PLANT—HOW TO GROW IT, AND ITS VALUE AS CATTLE FOOD.

BY JACOB BRAY, LISTOWEL.

In dealing with a plant we should in the first place become acquainted with its nature and its requirements. To do this, let us look at the corn plant where it flourishes at its best, and we will find it in what is called the corn belt, running across the American continent from east to west, and embracing the southern part of New York state and the states of Pennsylvania, Ohio, Indiana, Illinois, Missouri, Nebraska, Kansas, Colorado, Utah, Nevada and California. These states are all on or about 40 degrees north latitude. There is where we find the corn plant flourishing in all its glory. In this belt any variety of corn can be grown and matured. Now what is the general character of this belt of country in regard to climate and soil (the two things affecting plant growth) as compared with our country? We find it is warmer, generally drier, the season for plant growth longer, and, in the parts mostly devoted to corn growing, the soil is porous, warm and rich, such as the bottoms along the great streams, and the great prairie plains of the west. Now if we can furnish the same conditions we will be able to grow a rousing crop of corn. But we will have to admit that we cannot do so to the extent required to raise and mature every variety of corn, and we will also have to acknowledge there is a great variety of corn, and we very fortunately have to hand a number of varieties that differ to an extent which makes it possible for us to make a selection suitable for our locality. (In passing I might say that we have been experimenting for a number of years on this line, and that we have settled on the White Flint as the variety best suited for our climate and for feeding purposes.)

I propose now that we go to work and raise a crop of corn, by supplying as far as possible the conditions we find in the corn belt. We want, in the first place, a warm, rich and friable soil. My choice would be a well drained clover sod with say 20 loads of good farmyard manure to the acre, spread in the early winter on the sod ; then plow down as soon as possible in the spring, and give frequent shallow cultivation afterwards up to time of seeding. My practice has been to select the dirtiest and poorest piece of stubble land I had on the farm for roots and corn, give a good deep plowing in the fall, and spread the manure on through the winter from time to time as we could get ready, at the rate of 20 good loads to the acre ; then as soon as we could get at it we turn in the manure with the plow, and afterwards cultivate, harrow and roll as best suits the conditions, having regard to the weather and state of the land up to seeding time. The object we aim at is to kill as many weeds as we can get started before seeding, to have the surface mellow for a seed bed, and to get the manure well incorporated with the soil, thus putting the manure in the best possible shape to be dissolved and made available and accessible for plant food. We also find manure does good service in the mechanical effect it has on the soil by keeping it loose and less liable to break after being wet, (which by the way is a condition that should never be allowed). In this way we aim to provide some of the conditions necessary for the corn plant to thrive, namely the land porous, warm and rich. Before leaving this part of our subject I wish to remark that we have noticed that it is very important to have corn on a dry piece of land, free from an excess of muck, as it appears to have a stronger constitution to withstand our unsuitable climate ; for instance if we have a summerfrost you will notice that a piece of corn on a low place, if mucky, will freeze, while that on higher and sharper land has come through safe. This is very important, too, in the fall as you may easily extend the time for the corn to mature a week or so.

Seed Sowing. We will say that we are now ready to sow our corn, and from experiments that we have made in reference to what variety is most suitable to our locality we will suppose we have ready a supply of good White Flint seed corn, grown in the county of Essex, Ontario, or some other locality nearer the centre of the corn belt. We will take a quantity by weight enough to sow 4 drills across our field, in our case we will call it 40 rods which will require 5 lb. of seed or 1¼ lb. to the drill We will suppose the drill has been made ready to receive the corn, you know where the force feed was set last year, set the same now ; the delivery spouts are all closed but two ; the drill is a ten hoed one, you open the third spout from each end, which leaves 5 spaces between the hoes or a trifle over three feet. You will also have on the two outside hoes for markers to gauge the width on the return trip. You will start with your first drill about 2½ feet from the edge of land, and the 5 lb. of corn divided between the two delivery hoes. Go ahead, watching the feed carefully and adjust if necessary, and by the time we are around we know pretty nearly what we are doing. See that the drill is working deep enough to cover every kernel of seed, and do not allow a single grain to be scattered or exposed in any way on or about the field. This we consider quite important in keeping crows and blackbirds from the field. After sowing we go over the land with either the roller or harrow, whichever suits the condition of the land best, to fill up all ridges made with the drill leaving the land level and smooth.

Time of Sowing. In regard to time of sowing we find we must be controlled by circumstances ; we must wait for a suitable time, but be ready at a moment's notice. The Yankee's time is when the apple trees bloom ; this is I dare say about as near right as they can get it, for then you will find the soil is getting pretty warm and that is one of the conditions needful for this seed to germinate. Our practice is to wait for the soil to become fairly warmed and dry enough for a good seed bed, and about when the apple bloom is ready to open, but before it has fully opened, other conditions being fair, we sow our corn, our object being to make use of every day possible for the growth of the crop. Consequently we are disposed to take some risk in the spring in preference to leaving our crop exposed too long in the fall.

Cultivation of Crop. After sowing we watch for the weeds and corn, it depends on circumstances which gets the start. If the weeds are coming fast we would not hesitate to go over the ground with the harrow even before the corn is through the ground, but we prefer to have the corn well through; then we harrow lengthwise of the drills, generally once, but we have gone back and forth on the same track. There is no hard and fast rules applicable to such work, but we must use judgment in doing this kind of thing. We have harrowed our corn as much as four different times, and again we have been satisfied with once harrowing. Corn may sometimes be harrowed with advantage until it is six inches above the ground; the harrow will, in mellow ground, uproot a few plants and cover up more, and to relieve the plants that are covered or leaning, we use a common wooden harvest rake, going over the rows with it, combing and lifting the plants into an upright position. A man or smart boy can go over three acres in a day in this way, and we consider it an easy and cheap way of dressing the crop. I believe there is a better implement than the harrow for weeding and cultivating now in common use in the states; it is called Breed's Weeder. I have not seen this implement but it is very highly spoken of by those who have used it. Our practice is, after we have done with the harrow, to start right in with the hoe and finish any weeds among the corn that have escaped the harrow, and are out of reach of the scuffler; then scuffle right away, and in a short time start in again with the hoe keeping all weeds in check, and nursing the corn plants; then go through with the scuffler as often as we think is beneficial for the crop or for cleaning the land, or as long as we can get the horse through the crop. A word of caution we think is needed here in regard to using hoe and scuffler. Level and shallow cultivation is the order from first to last, the more particularly as the crop gets larger. Next in order comes

Harvesting. We will not speak on siloing the corn, as we have not had experience in that line, but will cut and cure our corn in the field. It has been said there is a time for everything. Well, the time to harvest corn in this climate is generally the second week in September; it should be ripe enough by that time, as we run too great a risk from frost after that time to let it stand uncut. The corn should be fully ripe enough for roasting, before it is cut. It will then be at its best for feeding purposes, that is, taking in the whole plant, stalk as well as grain. We find the easiest and best way to harvest corn is to take six rows; start in where you intend to make a stook; bring together say eight stalks from the centre rows, selecting them so that they will form a square; fasten the tops together, and you have a support for your stook. Commence to cut around this support, setting each armful up as you cut it; never let it go on the ground until it is standing in the stook, and so on until you have the stook as large as you wish, being careful to set each armful snug and straight in its place, keeping the stook well balanced. We find it best to let each one cut and build their own stooks as there are more likely to be the same set on all sides and not so likely to sway over. It is also well to get up a little rivalry among the boys as to who can get up the best stook; at all events it is very important to have the stooks well built. We find that we can work away all day if we choose without stopping to bind the stooks, as they will stand very well if the weather is good. This is an advantage, as we can tie in the morning before the corn is dry enough to cut. We have learned that corn should be dry when it is cut and stooked, and that it keeps better if set up as soon as cut before it has time to soften or wilt. Let the wilting be done in the stook, as it leaves it in a porous state and less liable to mould. For binding the stooks we use binding twine. We first pass a plow line around the stook about the middle, draw it up tight, then put on the twine and take away the plow line. We put a second band near the top of the stook bringing it to as fine a top as we can. Now if this is all well done we can reasonably expect our corn to stand the weather and come out in good shape; we had it in the field until February this year and found the corn as good then as it was on the 1st of December.

Feeding. We find in feeding it pays to run the corn through a straw cutter, using the longest cut. In this way there is no waste and no long stalks to go into the manure. One bushel of this cut corn is a fair feed for a cow. We fed this amount twice a day

this year, along with turnips while the cows were milking, each cow getting about ½ bushel turnips each day in two feeds, and some straw to pick through between times. We commenced to feed corn about the 15th of September, and fed right along all they would eat until the last week of January, when we began to reduce the quantity preparatory to changing the feed; working gradually on till about the 10th of February we finished the corn, or say equal to 4½ months for 16 head of cows, or equal to 11 cows for 6 months from about 3¼ acres of corn.

CORN CULTURE AND ENSILAGE.

BY EDGAR M. ZAVITZ.

I had a day dream. In it I saw this Ontario of ours under the joint sway of a mighty king and queen.

Treason! Treason! Oh no. It was only a vision. Calm your minds, and listen! This king under whose wise and benign reign the people were happy and Ontario prosperous was king corn.

Over in the United States they have crowned corn king of all the grains.

And if I may be allowed to predict, although I am well aware that some of you will ridicule my claims to prophecy, I will venture it as my belief that corn will ultimately be crowned king in this province of ours. I venture it in the face of the fact that the present acreage of wheat is five times, and of oats seven times, that of corn. Such a startling prediction must needs have some strong reason to support it. Let us see. The natural productiveness of Russia, India, the prairie states and of the great Northwest is rendering wheat growing unprofitable here. The thistle and the bug pests are well nigh victors in the conflict with the farmer for the pea crop. Local option and universal prohibition will greatly diminish the acreage of barley. Oats is the only crop that may hope to compete with corn.

But when we consider the present, and (on account of steam and electricity) the probable future low price of horses, the chief consumer of oats, and compare with the profitableness of cattle and their products, cheese and butter, and with pork at $9 per 100 lb., for both of which corn is the cheapest and most economical feed, we will see that corn is likely to win in the contest. By comparison we see that Ontario is well adapted for corn raising. In the southern states the highest average yield is put at 18 bushels per acre. In the northern states it is about 26 bushels per acre, while the Bureau of Industries gives the average for Ontario for ten years (between 1881 and 1891) as 33 bushels per acre. If corn is the national crop in the United States with an average of about 22 bushels per acre, is not an average of 33 bushels per acre likely to make it a provincial crop in Ontario?

Let us make a comparison in another respect. Let us find out how much an acre will be expected to return to us in value planted with corn, as compared with other grains. Taking the average yield and average price for 10 years ending 1891 as issued by the Bureau of Industries, we have wheat yielding 20 bushels per acre at 90c. which gives us $18 for the acre—at the present price it would be $13; barley 26 bushels @ 54½c. would be $14.17; peas 20 bushels per acre @ 61.66 would be $12.81; oats 35 bushels @ 36c. gives us $12.60. Corn in the ear, 66 bushels @ 29c., gives us $19.14. But you will say that corn takes more work than any of these crops. I might suggest in reply, that no account has in this estimate been taken of the stalks, which are in many cases the very thing that leads to the raising of corn, and will, we may safely believe, more than pay for the extra work. Thus I have found from figuring up proof of what I have of late years maintained, that corn is our best paying crop.

Wheat and oats especially are exhaustive on the land; while corn, that feeds more extensively on the elements in the atmosphere, does not draw on those in the ground so greatly.

Having established the claims of our king to the throne, let us consider how to inaugurate him, and make him worthy of the high position and honors. First it will be necessary to get him married. You know that is a subject of great anxiety and diplomacy and scheming among the heirs of royal blood. Where shall we find a fitting bride for our king? To any one who has studied the culture of corn and the feeding of ensilage, the sweet smelling clover readily suggests itself as a fit companion for our corn king. Prof. Henry, of Wisconsin, says that red clover and corn are the crops that the farmers had best fall down and worship and not be running off after strange gods.

Perhaps you may think I am a long time getting at the commencement of my subject, which is I believe, corn culture, but I thought that what I have to say about the best methods of growing corn might be of more use if I first could induce you to grow corn and to grow more of it. Although we can raise good crops of corn on the same piece of land successfully and successively as long as we choose, yet it is my opinion that it is more economical to bring it in a rotation of crops. I would precede it with clover, so as to have the clover stubble to plow under for corn; then follow the corn with wheat and barley followed by oats and seeded down to clover again. For light soils, I would manure clover sod in winter or very early spring, and plow under, together with the rank young clover which the manure will force to quite a growth, just before planting time. Harrow fine, roll and mark out in rows both ways 40 inches apart and plant in hills; I prefer hills, as the land can be kept cleaner and by experiment hills produce the largest yield. I like to plant early about the middle of May, of course varying with the season. I would endeavor to plant sufficient so that two thirds would, in ordinary years, fill the silo. The other third I would husk for the hogs cutting the stalks up in winter and mixing with the ensilage.

Corn exults in light, rich, moist soils, but if your land is heavy it would, no doubt, be better to plow in fall, enrich with fine manure during winter, if land is not rolling, nor the snow deep, and pulverize deep and fine before planting. Don't spare the manure. It will be in good condition for the next crop. The manure you have been carting to the root-field to grow water, may be devoted to the corn, for ensilage does away with roots

In the meantime the seed corn must needs be cared for. Gather the best and earliest ears before any frost, braid it up and hang it as close to the kitchen stove pipe as your wife will let you, and if she is not more nice than wise, in two or three weeks it will be dried so thoroughly that it can be put out of the way and if kept dry no sort of zero weather can injure its vitality.

As the corn is coming up in the field and before the leaf unrolls, it should be harrowed. Some advocate harrowing at intervals till it is four or five inches high. I do not practice that method, for, especially if the weather is damp, it gives the smut-spores that are wandering in the atmosphere on the lookout an admirable opportunity for getting a foothold in the mutilated places of the plants, and finding thus an easy doorway, each little microscopic atom will flower out into a magnificent bunch of smut.

If it is grass that comes up instead of weeds, which is most likely the case after sod, the harrow does very little good. The after cultivation should be frequent, especially in dry weather, to invite and retain the moisture; thorough, so that no weeds will filch away the nourishment; shallow, and each time shallower, lest its roots—the throughfares of its supplies—be cut off. The ground should be stirred as soon as dry enough after every heavy rain, as the crust thus made excludes the air and checks the growth. When it is tasselling out we will leave it to the kindly beaming sun, the gentle rains and the refreshing dews.

We have a chance now to look at the silo and glean a few important hints as to its structure. The shape is important. From my experience I would say allow seven square feet of surface to each cow. Allowing one cubic foot—45 lb.—as a daily ration of ensilage for a mature cow in full flow of milk, her space of 7 ft. square, 1 ft. deep would last her one week, and 24 ft. high would last her six months. With these figures you can easily determine the size of silo you need for your herd, 12 ft. square,

25 ft. high, would be sufficient for 20 cows and 1 heifer or 1 horse. It is admirable as a partial feed for horses, but I would not feed over 20 lb per day. It will cure and make old nags feel like colts.

A silo of the same height 12 ft. by 14 ft. will answer for 24 cows; 14 ft. square for 28 cows and 14x16 for 32 cows. I mentioned that it was good for horses They say it is grand for sheep, but as I have had no experience in that I cannot say. I fed out three or four tons that I had over last spring to hogs, and they seemed to enjoy it and make good use of it; but I would not recommend fedding it to hogs much except you are likely to have a surplus. But there is one species of live stock that I am satisfied will not thrive on ensilage and that is the veterinary.

Now the most important thing is to make your silo air-tight. The exclusion of the air is the principle of preservation. The cheapest and most effective material to accomplish this by is tar paper. Let other materials subserve the holding of that in position.

But the corn is just out of the milk period into the glazing and it is *now*, we must fill the silo. Isaac will take the corn knife and cut in the field taking four rows and laying the four hills in a snug armful. Walter and Egbert will take the hay rigging with the front wheels on behind and the hind wheels on before; let the wide board with cleats on for steps drag along behind to walk upon in loading. We'll get a good ready here. Hello! here they are with the loads. Hook on to the four horse power; pull the belt, and then hurry up and don't let it run empty. In twelve minutes the heavy load is cut up ready to store in the silo; four men and one boy will put in about twenty tons daily. If your neighbor wants help to thresh you can leave the corn and go and help them for two days at a time, with advantage to the ensilage and in urgent cases for three days, but under no circumstances over three days at a time or the ensilage will suffer. When the silo is full leave for two days to settle, then cover with chaff, marsh grass or any tight lying material, to about two feet; pack tightly while covering. Then let it remain till feeding time comes.

We will have a little time now, about two months, to talk about kinds of corn. I have been experimenting for the last two years with different varieties for my own private benefit. But I won't charge anything for the experience I have gleaned. Among all the kinds I have grown for silage I am now most favorably impressed with the Throughbred White Flint, a sample of which I have here for inspection. It is by far the heaviest yielder of all the flint varieties, and equals as shown by experiment, the well known M. S. S. It is a week earlier than the M. S. S., is more easily handled as the ears are nearer to the ground, the stalks are not as coarse, it has more foliage and makes, I am persuaded, sweeter ensilage. The common varieties such as the Smutnose, Longfellow and the common White Flint produce too lightly to suit me. I have not tested it long enough to recommend it as a main crop, but would advise you to test for yourselves, on your own farm, and then you will know. Take no man's word as your absolute guide, for what suits one farm, one locality, and one kind of soil, may not suit another. Be independent by trusting to your own judgment and your own experience.

But here comes the snow storm. Hustle up boys. In with the cattle. Open up the silo. Smell! All through the stables it smells like a sugar refinery. It smells sweet, but we find by tasting it that the nose is not a true judge. There is no ensilage but what is more or less acid.

When Mr. Simmons says his ensilage is sweet he simply means that it is not as sour as it might be. When they once get a taste of the stuff, you need no small boy with a stick to drive them into their stables, but when you open the door you will actually have to look out or they will run right over you. Now they are housed in, and barned in, comfortably for the winter. Always keep taking the ensilage from the top of the pit leaving it level and compact to exclude the air.

Feeding is a very important question, but I cannot enter into any detail on my already lengthy paper. The best of ensilage if not judiciously fed will fail of good results. We may kill our cattle with kindness. But you see we took precaution against that when we married our corn king to queen clover. Our sweet tempered queen will counteract any evil tendency on the part of our sour, surly king. The two together need

but very little complementing to form a perfect ration, as safe as any and the cheapest we can grow in Canada. I am feeding it together this winter and I think I know what I say. Now, my friends, are you willing to see, and are you ready to join with me in the prediction, that under the joint sway of the king corn and queen clover the farmers of Ontario might become prosperous, contented and happy.

TUBERCULOSIS IN CATTLE.

BY J. H. REED, V.S., PROFESSOR OF VETERINARY SCIENCE ONTARIO AGRICULTURAL COLLEGE, GUELPH.

Tubercle is a subject of immense importance, not only to veterinary surgeons, but to the public generally. It is important to the veterinary surgeon, because no subject offers more food for earnest thought, or more scope for scientific research to the public, because it has a very close connection with the great problem of providing our masses with a sufficiency of nourishing and healthy food. To stock breeders and agriculturists it is even of greater import, as by the spread of such a disease their best hopes are rendered fallacious and their profits materially curtailed.

Character. The greatest importance attaches to this disease, from the fact that it has been induced experimentally in a considerable number of animals of different species—carnivores, herbivores, and omnivores, by inoculating, and feeding them for a certain period with tubercular matter from the lungs and glands of diseased animals, as well as their milk. It exists most frequently in cattle, but it also affects, though rarely, sheep and pigs. It is characterized by a deposition of tubercular matter in the lungs and other organs—"any organ and even the muscles are liable to be attacked"—wasting of the tissues and other signs of imperfect or mal-nutrition, which leads more or less rapidly to a fatal termination, the tubercular matter undergoing various characteristic changes, according to the length of time it has been deposited, and modifying the symptoms accordingly. The progress of the malady is usually slow, and its commencement insidious.

Nature. It is a disease of mal-nutrition or mal-assimilation, and may be said to be almost peculiar to the bovine species. Experiments have shown that it can be produced by inoculating or feeding animals with the morbid product, tubercles being formed in the lungs and other viscera of animals so experimented upon, the deposition of tubercular matter not being confined to any particular organ.

Causes. There can be no doubt as to its being hereditary and it is also infectious and contagious. Animals with hereditary tendency to tuberculosis if well cared for and well fed may not develop the disease early, in fact they may possibly die of old age, having never shown any symptoms of the disease; at the same time their progeny will in all probability have the same hereditary predisposition to the disease and under favorable circumstances will develop and die from the affection. The exciting causes in animals so disposed are poor hygiene, poor food, exposure to cold, fatigue, etc., but no amount of exposure or ill usuage will excite tuberculosis in an animal in which the germs of the disease does not exist. Such exposure, etc, may cause lung trouble, or disease of other organs, but cannot produce tuberculosis. It has been proved by experience and experiment that cohabitation with diseased animals will cause the disease in healthy animals either by contagion or infection.

Symptoms. The progress of tuberculosis is sometimes acute but is most frequently chronic, and the symptoms in the milder cases are not always well defined. The insidiousness of the malady at its commencement renders its primary phenomena obscure; it may have been in existence for months before the earliest external manifestations can be fixed upon. Those in the habit of slaughtering cattle will often have occasion to note the presence of tubercles in the lungs or other organs of cattle which, during life, would not have been suspected of suffering from an incurable malady. The first perceptible signs are usually dulness and indifference, and less activity and energy; and in the female

there is often continued or frequent periods of œstrum, although they do not readily breed and the fœtus rarely comes to maturity. If the lungs be the parts affected, which is commonly the case, there will frequently be emitted a dry and deep, though feeble cough. This cough is not generally accon panied by expectorative or nasal discharge. The temperature is generally, but not always, more or less increased. After a variable time, dependent to a great extent upon the treatment and general hygiene to which the animal is subject, these somewhat obscure symptoms become intensified. There is general emaciation. Trifling exertion produces abundant perspiration and labored respiration ; advanced anæmia or bloodlessness is indicated by the appearance of the mucous membranes, which are of a pale yellowish tinge and infiltrated ; the appetite is diminished and capricious and digestion is irregular ; not unfrequently constipation is alternated with diarrhœa ; the milk is diminished in quantity and quality ; cows frequently abort. The cough is easily induced by pressure on the trachea, and occurs spontaneously at short intervals, being accompanied after by the expulsion of a viscid muco-purulent matter, which usually has no smell, though it may at times exhale an offensive ordor. The breathing becomes more difficult. Ascultation detects the respiratory murmur to be loud in some parts and dull or lost in others, or in places there are heard abnormal sounds such as rasping or of bubbling. As the disease advances the symptoms increase in intensity, emaciation becomes extreme and debility great and the fever is usually increased. The cough becomes harrassing, the mucous membranes become extremely pale, the heart's action tumultuous and the pulse almost imperceptible, and if the creature be not slaughtered it will soon die.

If the digestive organs be the seat of the disease and the lungs be not affected, we will have irregular digestive dérangement which will not yield to treatment, and in many cases the most skilful practitioner can merely suspect the disease until the animal dies and a *post mortem* reveals the true state of affairs. As I have already mentioned any organ may be affected, and the severity of the symptoms and the course and termination will depend on the importance of the organ attacked and the extent to which the disease has reached in that organ. Unless serious complications arise tuberculosis is a protracted malady, and may exist for a long time without causing any serious disturbance, running a sub-acute or chronic course.

Post Mortem Appearances. A post mortem will reveal deposits of tubercular matter in some organ of the body. These deposits exist in many different forms and sizes and are of different consistence—sometimes small, sometimes large, may be dry or moist, soft or hard, caseous or calcareous, or both. The recently formed tubercle is a little nodule, generally spherical when isolated, and varying in size from a point scarcely visible with the naked eye, to that of a grain of millet seed. Each little mass is dense and tenacious. Its color is at first greyish white, but when fully developed it is somewhat yellow and opaque ; large numbers of these generally accumulate and form one tubercular mass. The tubercles so developed undergo successive modifications which alter their character very much. The first of these alterations, which occurs in certain conditions is calcification, or impregnation of the tissue with earthy matter. This may be general or partial, and may exist in the same mass in various degrees. The calcified tubercle varies in size from that of a millet seed to a pea, is yellowish white, perfectly opaque, very hard and feels like a little stone in the tissues. At this stage the tubercles are never isolated but are collected in various sized masses. Another modification of tubercle is softening, which occurs whether calcification has taken place or not, and consists of a degeneration which terminates in caseous softening. This alteration commences in the centre and extends towards the circumference of the tubercle. In some cases several organs in the same animal are affected to a greater or less extent.

Contagion. There can be not doubt that the disease can be communicated from diseased to healthy animals by cohabitation, either by direct contagion as the introduction of the virus into the circulation, by infection as a healthy animal inspiring the expired air of the diseased, or by feeding animals on the meat or milk of diseased creatures. Evidence is quoted which appears to prove that not only is the disease communicable by cohabitation, but that stalls and stables may become so contaminated by animals suffering from tuberculosis, that they will infect sound animals which afterwards inhabit them.

VITALITY OF THE VIRUS. Inoculation has demonstrated that the tubercular matter preserves its virulence though three or four removes, and successful inoculations have been made with tubercular matter from a patient that had been dead thirty-six hours, and with sputa that had been in a dried condition for twenty days; and it has not been proved that the virus will not maintain its vitality for a much longer period.

The period of incubation, or the latent stage, does not appear to be well defined. From ten to twelve days after inoculation tubercles have been found in the lungs, and the interval may be said to extend from a week to some months or even longer, before any marked symptoms appear.

It will be seen that it is very dangerous to use either the flesh or milk of tubercular animals. It is also very unwise to breed from affected animals as the disease is undoubtedly hereditary. Hence it comes our duty to endeavor as far as possible to exterminate the disease. It is incurable, therefore curative measures are not adopted. In order to prevent its extension and exterminate the trouble as quickly as possible, all diseased animals should be slaughtered without delay, and stalls and stables in which they have been kept should be thoroughly disinfected. All suspected animals should be isolated and every precaution observed with regard to preventing contact.

ROOT CROPS AFTER SOD.

BY D. BUCHANAN, B.S.A., HENSALL.

Of the various places in the rotation for the root crop, possibly one of the best is after sod. The suitability of this method of rotation and the manner of cultivation adopted is dependent to a certain extent upon the nature of the soil. On an ordinary clay loam, the most convenient of the following methods may be adopted: First, apply the manure in the autumn and plow under. Second, plow in the fall, and if the manure is well rotted, apply in the winter by spreading from the sleigh. In the spring it may be incorporated with the soil by surface cultivation. The third way, and one that is more in accordance with modern principles of handling manure, is to spread the fresh manure on during the winter and plow under when the season opens. If the plowing has been done in the fall a fine tilth is more easily secured in the spring. For spring cultivation use the ordinary harrow and the disc or spring-tooth harrow.

The mangels may be sown on the level with the ordinary grain drill, by allowing only certain of the spouts of the drill to sow and regulating it to sow the required amount. Mangels can be got in several days earlier than the usual time by following this plan. If the land is at all dry or the tilth not very fine, the use of the land roller will pack the particles of earth more closely around the seeds and aid in the retention of moisture. That portion of the field required for turnips and corn should receive sufficient surface cultivation to keep down all weeds and to give a fine tilth. We include corn under the head of root crops in this paper, simply for the reason that this crop is usually grown in the same field as the root crops proper, so that in discussing cultivation it is more convenient to class it under this head.

The corn is sown with the seeder in the ordinary way by allowing only certain spouts to sow, but the distance between the drills and also between the different plants in the same drill should vary according to the nature of the variety grown. Thirty inches between the drills and four inches between the plants in the drill is sufficient for the smaller and early maturing varieties such as Compton's Early and the Thoroughbred White Flint. Where such large growing varieties as the Red Cob Ensilage and the Mammoth Southern Sweet are grown, the distances for planting should be greater, say from three feet to three feet and a half between the rows and from six inches to a foot between the plants. The turnip land will require to be lightly drilled, as while theoretically the flat cultivation for turnips is all right, practically it is better to have them on small drills on account of the diminutiveness of the young plants when they first appear above ground.

Different methods may be adopted in putting in the potato crop. If the sod has been plowed in the fall the spring cultivation before planting time will be the same as that for the corn and turnip land. Plow in the potatoes by simply making a mark with the plow, planting on the scratch and then going one round on each of the rows planted, thus turning two furrows on top of each row of seed potatoes. In this way a sufficient amount of earth will be placed upon the potatoes without disturbing the old sod. Another system of planting potatoes on sod and one which many follow with marked success, is to refrain from plowing the soil at all until planting time, spread the manure on the field during the winter and in the spring a good, strong growth of grass will come up. When ready to plant, commence plowing the field in the usual way, except that you make every third furrow somewhat shallower than the others and plant the potatoes in this furrow. By the use of a skimmer or chain the grass may be neatly turned under and a nice surface left. In districts where the land is a stiff clay, this latter method cannot be followed so successfully, but on a loamy or slightly gravelly soil it has given the best of satisfaction. An old sod is not so suitable, however, as one that has been down for but a few years. In cultivating the potato crop, the ordinary hilling up is quite unnecessary ; a very slight ridging at the time of the last cultivation is all that is required.

The cultivation of root crops generally should be thorough, should continue far on in the season and both horse and hand hoe should be used sufficiently often to keep down all forms of weed life. The cultivation during the fore part of the season is better to be deep but must become shallower as the root development of the plants extends Corn may be cultivated, if a short whiffletree is used until it is fully grown. The defect in the present method of cultivating the root crops and that which makes it less effectual in cleaning the land than the bare fallow is that cultivation is not continued long enough, that the finishing stroke is not given to the work, and that the battle with weeds is not fought to a finish Diligent cultivation in the growth of some useful crop as a method of cleaning the land is fast displacing the bare fallow, which practice will soon be numbered with those of the past.

OUR COMMON ROADS.

BY J. C. CLARK, AGINCOURT.

It will be generally conceded that the condition of our common roads has much to do with the prosperity of the farmer. That good roads enrich him financially by enhancing the value of his land, and decreasing the cost of marketing his produce ; that they also tend to elevate him socially, widen his influence, and contribute to his happiness by bringing him in closer touch with the civilizing influences of the busy world, will not be denied. The question of good roads is one which concerns him more than any other class of the community.

Our roads as they are cost us vast sums of money directly, and a far greater amount indirectly, in the increased cost of getting our produce to the market. Better systems of supervision, better methods of construction and repair are absolutely essential if we desire to make any improvement. Our roads now are a disgrace to our civilization, and for this state of affairs our present system of construction and maintenance is largely responsible ; it is about as crude and faulty as could well be conceived, even if it were carried out with vigour and effect, and no one will pretend to say this is now done. When the country was new, when produce was the only method of exchange, when money was almost unknown, the present system of working out the road tax not only answered a useful purpose, but any other was absolutely impossible. The only method of making roads that they knew of was to turn out and make them themselves. No engineer skilled in road construction, conversant with the best methods of Macadam and Telford was needed. The first work was to cut down obstructing trees, remove the stumps, fill up the holes, level down the knolls, and let off surface water. The next step was grading, and for this purpose the road shovel was invented, and with it this has been more or less efficiently effected. Efforts are now being made towards the construc-

tion of permanent highways by the use of gravel and other road-making materials; but here the system has utterly and completely broken down. Nor need this be a matter of surprise; the result was inevitable. We have only to examine the system to account for the failure. First we have the municipalities divided into sections, termed road divisions, for the maintenance of which the land adjacent is taxed so many days' statute labor, and one of the taxpayers themselves is entrusted with the responsibility and direction of the expenditure in his division, and no matter how competent he may be, no matter how carefully and skilfully he may direct the labor under him, he is liable to have his whole work undone the very next year by an incompetent successor. These road overseers being changed each successive year, no continuous plan of improvement is possible. Each one patches and pares at his own sweet will without reference to what has been done previously, or what is likely to be done after. We are thus spending in labor and money to carry on a system of insufficient and shiftless maintenance more than would be sufficient to keep in proper repair double the length of high-class roads under the methods pursued in France and some other European countries. The first thing to be done is to change the law under which the roads are now worked. It is by no means certain what system should finally be adopted as the best, but the present is about the worst that can possibly be conceived, and stands as a barrier to any improvement until it is overthrown. It offers a premium to laziness and inefficiency, and there is no way to stop it except to abolish it. Legislation is needed to abolish the chance to work out the road tax and substitute a cash tax in its place. Even if the money thus raised was placed in the hands of the local road overseers, to be expended under their direction, it would be an improvement, as not many men would tolerate idleness in men hired to do a day's work. But this would be a short-sighted reform at best, as few men now acting as road overseers know how to make good roads, or are competent to spend the money thus raised wisely, or to the best advantage in maintaining them.

If a cash tax were substituted for the present system it would be necessary to have road commissioners and a superintendent skilled in road construction to carry out their directions. Of course, this may seem expensive, but in the end would prove much more economical and effective than our present system, or rather lack of system.

While our Dominion and Provincial Governments and our municipalities have treated our railways with boundless munificence, they have done little, or comparatively little, for our common roads. This is in striking contrast with the methods pursued in France and some other European countries. In France the Government have expended about $600,000,000 in the construction of her common roads, and expends yearly about $18,000,000 in their maintenance. The Government employs a large staff of trained engineers in its special department of roads and bridges, and to these are entrusted the work of constructing and repairing the common roads. These comprise *national roads*, connecting important cities and towns, and *departmental roads*, connecting chief cities and towns in the departments. The less important roads are further divided and classified. All the roads in a department—corresponding somewhat to our counties—are under an engineer-in-chief, while under him and subject to his directions are the various superintendents and overseers. Every road is divided into sections varying in length according to its importance, and each sub-division is placed in charge of one who is responsible for the constant excellence of its condition. The economic worth of these roads to the French people may be inferred from the following report by F. B. Loomis, commercial agent at Etienne, to the American Department of State. He says: "The road system of France has been of far greater value to the country as a means of raising the value of lands and putting the small peasant proprietors in easy communication with their markets than have the railways. It is the opinion of well informed Frenchmen, who have made a practical study of economic problems, that the superb roads of France have been one of the most steady and potent factors in the material development and marvellous financial elasticity of the country. The far-reaching and splendidly maintained road system has distinctly favored the small landed proprietors, and in their prosperity and the ensuing distribution of wealth lies the key to the secret of the wonderful financial vitality and solid prosperity of the French nation."

Under date May 29th, 1891, United States Consul Oscar F. Williams, writing from Havre to the home Government, says: "Every freighting and market cart here is a road-maker. Its tire is from three to ten inches wide, usually from four to six, and so rolls the road. With the few four-wheeled vehicles used the tires are rarely less than six inches, and the rear axle is about fourteen inches longer than the fore, so that the hind wheels run in a line about an inch outside of the line rolled by the front wheels; thus with a six-inch tire two feet of road width is well rolled by every passing waggon. The varied gauge is also usually observed with cabs, hacks, and other four wheeled vehicles, so that they become road-makers instead of rut-makers, as in our country. The cost of highway transportation over the properly built roads of France does not exceed one-third the like expense in the United States, it being common in the rural districts of France to haul three tons, and in the cities from three to five tons freight net with one horse."

It will thus be seen that wide tires form no inconsiderable part in maintaining the excellent character and efficiency of the French roads. So important, indeed, was this matter of tires looked upon by the Legislature that it did not consider it beneath its dignity to spend two whole days in discussing their proper width, and vehicles are now taxed in proportion to their width of tire—the wider the tire the less the tax. It is idle to undertake to maintain our dirt roads in good repair while they are subjected to the effects of narrow-tired vehicles. No matter with what care they may have originally been constructed and rolled to a compact surface, rains will soften and narrow tires on heavily-freighted vehicles will quickly efface the good effects of the labor expended on them. Nothing can be more costly or ridiculous than the custom of hauling produce on narrow two and one-half or two and three-quarter inch tires. Use, observation, and careful experiments combine to prove that wheels of two and one-half inch tires cause more than double the wear on a road than wheels with four or four and one-half inch tires. Wider tires tend to roll the road and keep it smooth and passable. Narrow tires cut up and destroy even the best constructed Macadam or Telford roads, besides increasing the difficulty and adding to the expense of hauling upon whatever kind of vehicle used. Another advantage of wide tires is that under many circumstances the load may be hauled with much less expenditure of force. The following proportions of loads to width of tire is given by the best authorities: For loads of from 1,000 to 1,200 lb. on each wheel the tires should be four inches wide; for loads of from 1,200 to 1,500 lb the tires should be five inches wide; from 1,500 lb. upward on each wheel the width should be six inches. As exception may be raised on the score of expense in changing from our present narrow to the wide tire, an invention has recently been placed on the market which promises to overcome this objection. It consists of an adjustable tire, which can be made of any desired width, and so constructed as to fit any of the waggon wheels now in use. It has a flange inside the tire which fits around the felloes and is bolted on to them. Should this invention prove satisfactory, a decided advantage will have been secured.

Another matter we might refer to which, although not strictly connected with the question of road-making, nevertheless has much to do with the convenience of traffic, and that is the difference between the gauge of wheeled and winter vehicles. If the distance between the runners of our sleighs was increased to four feet and the use of longer neck-yokes become general, much inconvenience would be obviated by enabling waggons to follow in the track of the sleighs.

In considering the making of roadways, the nature of the soil and the availability of suitable material has to be taken into account. From the nature of circumstances the common dirt road must always form the greater portion of our highways, and it is well to understand how this material can be used to the best advantage, at the same time aiming to give a more permanent character to those roads which, from the force of circumstances, are more generally used as main highways for traffic, by the use of other available and more suitable material. For this purpose the most commonly used is gravel, owing to its more general distribution in close proximity to where it is required, and the cost of preparation being less, it being only necessary to screen it to free it from

the earthy matter with which it is usually associated in order to use it. Next to gravel in cheapness and availability is broken stone, usually called macadam, and this, where roads are subjected to heavy traffic, has become of almost universal application.

Experiments have also been made with burnt clay, but with what success we are unable to say. In soils of a suitable nature the surface is removed and the underlying clay is thoroughly mixed with water to the proper consistency, over this is then spread coarse firewood, coal, or straw, the whole is then covered up and fired; on removing the covering the roadway is supposed to be burnt to the nature of solid brick. Unless the sub-soil was of an unusually tough clay, we do not think it would be successful as a roadway, as it would be of too soft a character to stand the grinding and pounding of heavy freighted waggons, unless protected by some tougher material, such as macadam or gravel. It might, however, be useful as a foundation for these materials.

Cedar or stone blocks or setts, asphalt, iron tramways, and similar materials are of too costly a character to be considered as applicable to country roads. We are thus practically restricted to the first-mentioned materials in the construction of our roads. In the limited time at our disposal it will be impossible to give more than a brief outline of the general principles involved in using these materials to the best advantage.

Starting then with the roads as we now find them, let us consider the best methods of maintaining and improving their present standard, while at the same time aiming to give a character of permanency to those more generally used as main highways.

The first requisite on a dirt road as on all roads is to provide for drainage. For this purpose the roadway should have a uniform grade from the crown to the side ditches or gutters, conduits constructed where necessary, all places of a springy or spongy nature thoroughly underdrained, and the roadway itself pressed to as compact and smooth a surface as possible in order to allow the rains to quickly flow off instead of soaking into and destroying it. A more general use of the road machine is recommended, as by its use the crown of the roadway can be prevented from becoming so hollowed as to retain the water, or forming a gutter for its conveyance. Another essential implement in the road-maker's art is the roller. It ought to weigh not less than four or five tons, and should always be employed to follow the machine, and the smoothing and compacting not be left to the action of passing vehicles, as is now too often the case, frequently a whole season elapsing before the road becomes decently passable.

A road constructed on these principles would be in shape to receive gravel or macadam as material for the formation of more permanent highways. If gravel be used it should be spread evenly to the depth of four or five inches and of the necessary width, to the side of this should be placed dirt to prevent it spreading, and the whole rolled to a compact mass. Over this again another layer of well-screened gravel, mixed with enough earthy matter to bind it, should be spread to the depth of four or five inches, earth again drawn up to the side, and again thoroughly rolled. A road so constructed will possess all the essentials of a good roadway. If macadam is used, it should be broken to as nearly as possible a uniform cube of two and one-half inches. A pointing of one and one-half or two inches of loamy sand is first spread, on this the macadam is laid in layers, each layer thoroughly rolled and compacted before the succeeding one is put on, the whole finished with one and one-half or two inches of tough gravel.

In Indiana good roads have been constructed at a cost of about $1,500 per mile. These are paid for by special assessment on the land two miles on each side of the road, somewhat on the local improvement plan. Land within half a mile is taxed $1.00 per acre, the next half-mile 75c. per acre, the next half-mile 50c. per acre, the next half-mile 25c. per acre. Bonds are issued and eight years given to pay the improvement. Some such method of assessment or a modification might be advantageously adopted in our various municipalities. As our roads are much too numerous to be all maintained at a high standard of excellence, it would be necessary to select such as would be of greatest utility, regard being had to such as, from the nature of circumstances, could be most economically constructed and maintained. On these should be expended the greater proportion of the road taxes, while at the same time not suffering the present standard of the rest to deteriorate. What is needed at the present time is a more general diffusion of knowledge in regard to the principles of road-construction and repair. For

this purpose Government should be urged to appoint a Commission to enquire into the condition of the highways in the province, and the various methods of construction, maintenance, and repair; to institute investigation into the building of permanent hard roads, the best systems of grading and drainage, the various materials used, cost of construction, and durability, together with the best systems of taxation for procuring funds for their construction and maintenance, or any other information in connection therewith; also as to methods adopted in the United States, England, France, or other countries, that might be applicable to the conditions existing in our province; by inviting competent road engineers to prepare essays, and have the same distributed through the medium of the public press and farmers' institutes; by employing competent men skilled in road construction to deliver lectures, or in any other way that would be likely to extend such useful information as might result in the adoption of better methods tending towards a much-needed reform.

THE KIND OF CATTLE FOR THE BRITISH MARKET.

BY THOS. MCMILLAN, CONSTANCE.

In thinking upon this question, I am led to the belief, that, had our farmers' institutes been in existence twenty years ago, this is a subject which would scarcely have engrossed the attention of a single individual. This is but another instance of the changes which have come about, the strides we have been making, and the new markets which have opened up to us during that time.

In September 1874, the first experimental shipment of 273 live cattle was taken to Liverpool, 270 of which were landed alive and in prime condition, and sold for an average of £33 per head. During that year there were shipped 455 head in all.

Such was the beginning of a trade which has enlarged to such proportions, that in 1890 there was a total of 642,593 head exported from the United States and Canada.

Up to the present time we have had the exceptional advantage over other countries in being allowed to land our cattle and have done with them whatever should be done in order to reap the most profitable return. This privilege has heretofore allowed us to ship cattle in any condition, either as stockers, short keep cattle or cattle in prime condition. But as long as the present restrictions remain in force, the one great requisite which farmers must beware of in order to have cattle which will command a paying return, is to have their cattle well fatted. I have always maintained, that the placing of an embargo upon Canadian cattle is the first thing which would ever teach Canadian farmers and compel them to fatten their cattle properly. Hitherto we have been able to reap a fair return upon thin and half-fat cattle, but so long as this restriction remains, it will be only ruinous to ship any cattle except those in prime condition.

As to the kind of cattle we should have, if I were to advise the kind which seems to command the highest price in the British market, I would say go in for the Black Polled Angus. It is astonishing to stand around a sale ring and watch a Polled Angus bullock being driven in now and again They command the top price every time. They are a hardy breed of cattle; their beef is of excellent quallity, and they are credited with having a larger percentage of meat in the carcass as compared with their live weight than most other breeds.

Apart from these of which there are very few in this section, the Durham grade generally commands a first place in the butcher's eye. It is a well known fact that the Durhams have been more largely used for the improvement of other cattle than any other breed, and I think that, so far as experience has gone, it has borne out the wisdom of such a course of breeding, as the Durhams seem better adapted for this purpose than any other breed, owing no doubt to their better ability to transmit their own qualities to their offspring. In breeding and raising beef animals for the British market, they should be of good quality, with soft skins, and as evenly fleshed as possible. The main points are a good straight broad back, well sprung and deep in the rib, well filled behind

the shoulders, good hams and brisket, short legs, a fine clean-cut neck and head, with nice and well set horns. In fact our advices from the British market are constantly calling for a prime article. During the time this trade has been in existence, our beef cattle have gained a most desirable reputation in the British market, and it is the plain duty of every Canadian farmer to endeavor by a system of selection and judicious feeding, not only to hold that reputation, but to continue to improve it: and the only way in which this can be done is to make war upon all scrub animals. They are a positive sign of want of thrift in every barnyard where they are to be found. We must never forget that there is still plenty of room for a vast improvement. No individual can drive along the side-roads and concessions of even this county of Huron without concluding that there is still room for a great improvement in the quality of our cattle. We must make up our minds that the day of the high-backed, raw-boned, slab-sided steer is past. They are an unprofitable commodity to have; they are not wanted, and the narrowing margin of profits will not allow us to raise them. We should always bear in mind that the same quantity of food which will put two pounds of additional weight on a scrub, will put nearly three pounds on a well bred grade, and I would hail the day when every farmer will vow that he will not keep a bad animal on his farm; and until that time I hold the proof is wanting that we are sufficiently interested in our business. How often do we still follow the common practice of deciding a year ahead from which cows we intend keeping our calves. These will be taken to a good bull, and the others will be served by a scrub bull for the sake of 50 cents or a dollar in the service fee, although perhaps the year following they intend keeping the calves from these very same cows. This in itself is a ruinous practice, and will never yield satisfactory results, as every one who knows anything of the principles of breeding, knows well that any one conception always affects a succeeding one either beneficially or otherwise. Therefore we should follow rigidly the practice of breeding from nothing but pure bred sires. Not only this, but if we wish to attain the desired standard we must also follow such a judicious system of feeding as well as ensure a steady and continuous growth from the time the animal is dropped until it is ready for the shambles. For although breeding is a great requirement, yet I claim that a liberal system of feeding will do just as much, and the one great point which we should never grow weary of impressing upon Ontario farmers, is the great folly of allowing our young animals to fall away in flesh. There is no mystery or no secret in the growth and rearing of animals. Every additional pound weight put on an animal represents so much food, and is a certain cost to the farmer. Whether the animal is getting heavier, losing flesh, or remaining stationary, it costs its owner so much every day; therefore it is evident that the only source of profit from its food is to be found in the increase of weight, which we may be able to obtain. Hence the utter ruin which must result, and which does result, from the current practice of allowing cattle to go on bare pasture in the summer and run around strawstacks in the winter. This practice not only retards their present growth, but it so contracts their digestive systems as to render them unable to manipulate their food so profitably when being fitted for the market. And this too, is the reason which compels many farmers to feed their beef cattle such heavy grain rations when stall feeding them. If young animals were kept and fed properly, they should in a measure be nearly ready for the butcher at any time, and when we know that more gain in weight can be obtained from the same amount of food the younger the animal is, it becomes our duty to furnish our young beefing animals with such full and appropriate rations as will bring them to maturity as early as possible. Every one who knows anything of the nature of animals knows well that while the animal is young and in the rapid stage of its growth, its digestive and assimilative functions are most active; the percentage of waste in its system is much less than after it reaches maturity, and that the older it becomes, even before it reaches maturity, the more food it requires to supply this waste. Therefore it is that the same amount of food will produce so much more weight when the animal is young than afterwards. Hence our duty to mature our animals as early as possible, as early maturity offers the only safe system of profitable beef production.

Our beef animals should be ready to ship to Britain from at the longest 2½ to 3 years of age, and we have often shipped good two year olds which have given fully as profitable returns as any. The only thing in favor of heavy cattle, is, they can be shipped for the same cost as lighter ones, so that so long as you have good quality the weight is an advantage; but never sacrifice quality for weight, so long as they can be landed in the old country from 1,250 to 1,300 pounds in weight.

Considerable difference of opinion seems to exist respecting the probable effect which the present embargo upon our cattle is likely to have upon their selling price. Doubtless it will cause buyers and shippers to move cautiously, and endeavor by this means to purchase at a lower price; but it is evident that these restrictions cannot have the effect of increasing the supply, but, rather, of improving the quality and conditions of the animals sent forward to the market. Therefore apart from the fact that butchers who have been accustomed to buy a sufficient supply to take to their private stables to meet their trade for a week will hereafter be forced to buy and slaughter only what they require for their present needs, I see no reason why we should entertain gloomy hopes as to the unprofitable returns we are likely to obtain, and if experience as an eye witness counts for anything, I have many times considered in watching American cattle sold in the lairs, taking quality into consideration, that these animals brought nearly as much as did Canadian cattle in the open market.

FUTURE OF WHEAT GROWING.

BY THOMAS B. SCOTT, VANNECK.

With wheat at 60 cts. a bushel we can hardly expect to get up much enthusiasm in its culture. Yet having carefully considered the advantages of wheat as a part of the farm crop, with the outlook of future sales, I am satisfied that Ontario will not abandon wheat culture. I claim for it: (1) An abundance of straw for the food and bedding of stock. (2) The best and almost the only crop that will always insure a good catch of grass seed. (3) Rotation of labor. The importance of this will be seen when we remember how short the season for spring seeding is before the first of May, and every week's delay in sowing after that date loses us bushels on every acre. But for the fall wheat crop we must either suffer this loss or increase the force of teams and men. Again it fills the space between haying and spring grain harvest. (4) The crop being removed early gives an opportunity for midsummer plowing, which means weed extermination. We find that by plowing clover stubble as soon as the first crop is removed and keeping the surface clean till time to sow fall wheat, the hot weather will rot thistle and other weeds, and give seeds in the soil an opportunity to sprout, will make a perfect seed bed for wheat and that with but once plowing. With these advantages, I think we can grow it as a feed crop. I see at the Agricultural College experimental department in 1890 and 1891 fifteen varieties gave an average for the two years of 43 bushels per acre, average weight per bushel, 61 lb. This equals in weight 76 bushels of oats. Their comparative values by analysis put wheat $1.13 cts., oats 98 cts. The extra value of wheat would call for about 15 bushels of oats to be added, making 91 bushels per acre. I take their returns with six varieties of oats: average, 53 bushels; highest, 82. This leaves a large margin in favor of the wheat. I have now come to the most important consideration in the future of wheat growing. The press of this country has been discouraging the farmer by telling him that he will be driven out of the wheat markets of Europe by the wheat fields of Russia and India. This has had no doubt a depressing effect upon the market and was likely circulated for that very purpose. I am happy to state that if we take the yields of these two countries we will find little cause for alarm. Russian yields average from 7 to 12 bushels per acre, with a large proportion of fall wheat winter killed. True, they often sow again with spring wheat, but there is twice seeding on a very small yield per acre. India's yield is still lower, being 3½ bushels per bushel sown. Again Russia's largest output was 21 years ago. She has been decreasing ever since. India's largest output was 13 years ago, and she too has been

dropping with a great variety of products better suited to the country, many of which are shut in by a tariff while wheat was allowed a free market. Whatever may be said of the uncertainity of reported averages, one thing is certain, wheat has reached 60 cts. or feed prices with a two years' bread famine in Russia, proving conclusively that Russia no longer controls the wheat market. A few conclusions from these facts: Wheat is not a luxury but the first staple of food. It must and will be grown somewhere, and that will be where it can be grown cheapest. Other things being equal that will be where the yields are highest and quality best. I believe the depression is largely due to the abundant wheat crops in America in 1891 and 1892. I believe America has supplied at the very least 70 to 75 per cent. of all that Europe bought, as in 1890 she supplied 66 per cent. If the yield of the country, then, which supplies three-quarters of the market were to fall off to any great extent what must be the effect upon prices? If Ontario is not better adapted to wheat culture than the average of the United States then it might be well to diminish our wheat acreage. Ohio still claims to be a good wheat state. I got returns for 8 counties, and the average was a little under 10 bushels to the acre. Surely, then, Ontario's 43 bushels of 61 lb. wheat with 15 varieties for two years should inspire our confidence in both our country and in the Agricultural College. Let us read, think and act, till not only in wheat but in all other products suited to the soil and climate of Ontario, we shall be found in the front rank.

RURAL *VS.* CITY LIFE FOR OUR BOYS.

BY MRS. J. D. SMITH, WHITBY.

We are quite in sympathy with the maxim that the advantages of a short and sharp campaign are now usually recognized in war, politics and essay writing.

A recent writer has said that the best butter thinly spread over too large a slice of bread is practically wasted, and rarely do we find that a drama in ten acts is appreciated, though it may be good. It is concentration that is the essence of success, and on this principle I will address myself to my subject.

The fact of the increasing tendency of our sons to leave the farm and abandon its pursuits is one which we have observed with deep regret. In our way of thinking agriculture is one of the noblest arts of civilization and it certainly supersedes all others in one particular—that of being primary in supplying us with the necessaries of life. From its position of precedence it has overlooked the rise of all the other arts. Look for a moment at the relation it bears to other industries. It is not only the original cause of the establishment of many of our manufactories, but it supports them after they are established and its products add materially to the commercial interests of our country.

Then the practice of agriculture is healthful and invigorating, and there are many pleasures connected with life in the country which are coveted by those in the cities and towns. Where do our brothers in those places, whose minds are wearied with the anxieties of life and whose bodies are weakened by overwork or irregular habits, go to seek for rest and recuperation?

Inclination and reason point them to the country, and it is in the enjoyment of rural delights at least if not in rural occupations that they endeavor to build up their enfeebled energies.

But I fancy I hear some young man say, it is so monotonous and humdrum on a farm, and usually so far away from any place of amusement. We contend that there is more monotony in a business or even a professional life. What can be more humdrum than the constant dealing out of goods or the sameness of the ever-recurring, two and one are three, three and seven are ten, etc., of the accountant from morning till night. Then too, the life of the mechanic is monotonous.

There is the brick upon brick of the mason, and the board after board of the carpenter the year round. The professions also are most of them subjected to more or less of routine and repetition, which in a short time becomes wearying to those engaged in them: but the succession of the seasons brings to the farmer a pleasing variety and change of work.

As regards amusements, it is too often the case that young men, and especially young men from the country, who have come into the town to seek a fortune, are led away from right paths and dragged down to destruction by attending those so-called places of amusement. Time was when winter evenings on the farm may perhaps have been a little dreary, and young men and older ones too have been tempted to while away a few hours at the blacksmith shop, or the country store, and sometimes we are sorry to say, at the village inn. But there is no excuse for their doing so now. Agricultural papers, newspapers, and the works of good authors are so widely circulated that they are within the reach of almost everyone who cares to read.

Our observation of farming has not failed to convince us that there is much hard, earnest work in connection with success in rural life, and that very often especially in the summer season, when the farmer comes in from his work he has little or no inclination to do anything except rest his weary limbs. Yet there are winter evenings and other times when the reading of well chosen literature interspersed at times with music and innocent games, would add to the enjoyment and instruction of the farmer, and gratify in the younger members of the family, the craving for amusement. It would be well for our boys to read works pertaining to their vocation. Agriculture vies even with the learned professions in opening up a wide field for study by pursuing which the young farmer can pass the time not only pleasantly but profitably.

Perhaps our boys think that in leaving the farm they are bettering their social position, but this is a mistake. Just here allow me to ask our young men who contemplate leaving the farm, what inducements are offered to them by the trades or professions which would better either their circumstances or social position? Are they not already overcrowded, and do not many who have fitted themselves for those pursuits, find it exceedingly difficult to secure employment?

We fully agree with Goldthwait when he says: "That for health and substantial wealth, for rare opportunities for self-improvement, for long life and real independence, farming is the best business in the world." It is only ignorance and false pride that sneer at those who till the soil and who are, as our politicians seem to take a great delight in telling us at election times, the *backbone* of our country. The social position of the farmer is asserting itself and becoming generally recognized. There is no reason whatever why the homes of farmers may not be beautiful both within and without, nor why with our present educational advantages the refinement and culture found there should not equal that which we meet with in town homes.

Then too, farmers are taking a stand politically, and it is becoming almost universally admitted that their best interests and the country's prosperity are identical and that, in the words of Will Carlton's "Song of the Plow," it is:

> "The old plow, the bold plow, that
> Moves the world along."

But I fancy I hear some young man say, farming is a slow, hard way to accumulate wealth and every young man cannot be a farmer any more than he can be a professor or tradesman. Allow me to ask that young man what pursuit he purposes to engage in where he will make money much faster and make it honestly? From carefully prepared statistics in a book written by Senator Macdonald, one of the leading merchants of Ontario's metropolis, we find that 97½ per cent. of those who engage in business fail. Is this the case amongst farmers? Rather than risk the chances of being successful against so great a percentage of failure, would it not be better for our young men to hew out for themselves homes as our forefathers did years ago, in some of the yet unreclaimed portions of our Dominion. True they would no doubt meet with many hardships and would have to work under great difficulties, but did not our ancestors endure similar hardships and encounter similar difficulties when as pioneers they opened up this beautiful Ontario which we are proud to call our home? And there is no pursuit whatever, in which any young man can engage, where difficulties will not have to be met and overcome in order to insure success. The many labor-saving appliances of this century have also materially lessened the ardurous toil of the farmer which should make it a less objectional pursuit in the estimation of our sons.

There may just now be a feeling of depression on the part of some on account of the low prices of the present year. But have you not observed that seasons of depression, similar to the present, are almost invariably followed by a season of prosperity. May we not predict then that "There's a better time coming boys," if we only "wait a little longer." And although we may not be making money very fast we are at least making a living, which is equivalent to money. As a rule, people travel slowly on the road to opulence, and while it may seem to some that farming is a slow way to make money, yet they should remember that if they would succeed in any occupation whatever, it must be by hard, earnest toil. There is not a more dignified or more noble thing in the world than honest labor. It is diligence which insures success, and in order to make our fortunes we must work and wait. We have in our own county many examples of the results of honest, earnest toil. Within a radius of a few miles from my home, are many well-tilled farms and comfortable and commodious dwellings and outbuildings of farmers who commenced life as hired men and who by untiring industry and perserverance, have worked their way steadily upward, and are now in the enjoyment of the comforts and luxuries of life.

HOME.

BY MRS. R. R. MOWBRAY, PICKERING.

Home is a magic circle made by a union of hearts—a place of refuge and rest. It is also the chief school of human virtue, and should be the source from which is derived all that is elevating and enobling to the human mind. To the little child it is the world. The father's love, a mother's smile, a sister's embrace, a brother's welcome. It is the spot where he pours out all his complaints and buries all his sorrows. How often we hear persons speak of the home of their childhood. Their minds seem to delight in dwelling upon the recollection of days spent beneath the parental roof. Our nature demands home. It is the first essential element of our social being and cannot be complete without home relations. Home influence is mighty and is either a blessing or a curse clinging to us through life. Every human being is a centre of influence for good or evil and is exerting it by thought, word and deed. How great the responsibility then, of those upon whom the charge of the home rests. Their character should be pure and noble. One writer has given example as a true meaning for the word character. Our children are close critics, not easily deceived. How careful we should be that our example is in every respect worthy of imitation. Our habits are formed at home. There our first religious impressions are received which are lasting as life. A minister once said "Give me the first seven years of a child's life and I care not where he goes after." Napoleon once remarked, "What France wants is good mothers and then she will have good sons." I have also heard the observation, "Show me the daughter and I will show you the mother." It is our duty, no matter how humble our home, to make it cheerful, and reasonably beautiful and attractive, taking care not to go beyond our means in expensive decoration. Neatness and order should pervade every part. There is also such a thing as being too neat and too nice to take comfort in everyday life which is anything but cheerful. If the careful house-mother cannot rest while there is a finger-mark on the paint or a spot on the window-panes, her uneasiness will keep it from ever being cheerful. On the other hand if she has no care for the "look of things" her failure will be equally sure. We should provide amusements in our home for our young people. "All work and no play makes Jack a dull boy." Reading and study can become wearisome. The mind as well as the muscles needs relaxation, and no less work, mental or physical will be accomplished if an occasional hour be given to diversion and entertainment.

It is only a few years since games for children were only a few, such as Fox and Geese, Nine Pins, Authors, and a few more of the same sort, cards not being allowed as a rule. But the number of games and amusements adapted to our homes is yearly increas-

ing, and there are now so many that the trouble is which to choose without danger of spending too much time in recreation. We should try to choose games in which thought, foresight, calculation, and caution and other mental faculties are brought into action, avoiding games of a questionable character; for should any of our children be so unfortunate as to frequent the gambler's den we would not like to be reproached by the thought that the first lessons were learned in the home of their childhood under the parental roof.

In the present age where there is little or no difficulty in the way, we take it for granted that our children shall have a fair education in all the common branches taught in our schools.

The time was when it was thought that agriculture required little or no education. That an educated man should not waste his talents in so plain and humble a calling. That it was compromising to one's dignity for one to identify himself with the common duties of the tiller of the soil. Now it is clear that there is a very great demand for brain as well as muscle in performing farm duties. There is a general desire in the highest educated circles to devise the best methods for preparing our young men for that calling which supports all others. Hence our agricultural colleges.

With regard to home education, no matter what our circumstances may be, we should study the inclinations of each child and educate them in some calling or trade especially adapted to them, by which, if thrown upon their own resources as most young people are, they may gain an honest livelihood. The one great principle above all others I would impress on their minds, is truth divested of every disguise and concealment. It is admired by all mankind. It is the foundation of all human excellence, and the standard by which all things are to be judged. Teach them that all labour that tends to supply man's wants, increase his happiness and elevate his nature, is honest labor, and honorable, too. That the best capital in nine cases out of ten a young man can start with is robust health, sound morals and a will to work out his way honestly and bravely. Teach also to have a purpose in life. The man who starts in life with a determination to reach a certain position and adheres unwaveringly to his purpose rarely fails if he live long enough to reach the goal for which he set out. When quite young it is a good plan to give them a small interest in our business whatever it be; let them keep their own books in a business way which will form a good foundation for business principles in after years. Our girls should receive as much of the accomplishments as can be afforded, such as music, painting, drawing, etc., but let them early learn that the greatest accomplishment is to have a thorough knowledge of housework, which is not merely kitchen drudgery but contains all the beauties and comforts of home as well as its labours. In the last fifty years the change of programme in housework has been more marked than in almost any department of labor. Half a century ago one room was used for kitchen, dining-room and sitting room. One set of plates was sufficient for all the varieties of food set out for a family meal. Plain, coarse, but wholesome fare was sufficient diet. One garment of home-made material did duty for a year. Now mark the contrast. Sitting-room, dining-room and kitchen to be kept in order and in constant use. Very often three four or more courses of plates for a meal. Dish-washing is one of the tedious jobs of the day. So many varieties of dishes are to be prepared that it requires a busy head and nimble hands to do the work for a family of moderate size, not speaking of making and mending clothes, darning, patching, etc., a thorough knowledge of which, with the addition of family cares, requires more brains than are needed to become a lawyer or a physician. It calls into action all the faculties of mind and body, and one needs the patience of a Job and the wisdom of a Solomon to practice all its details. Hence housework is one of the most requisite branches of a girl's education. Last, but not least, I would recommend a careful training in those principles which will ensure for us a place in that Home of which it hath been said, "Eye hath not seen, nor ear heard, neither hath it entered into the heart of man, the things which God hath prepared for them that love him."

SOME POINTERS ON DAIRYING.

BY W. W. GRANT, LAKEFIELD.

So much has been said on the dairying industry of Canada by able speakers, also by literature issued by the various governments, by reports of dairymen's associations, by reports of farmers' institutes, and by the press, that I feel in presenting a paper to this audience on the dairy question somewhat similar to an ancient Greek of whom I have read, who had an infant child die and on the day of the funeral a very large number of people gathered to attend the interment. On beholding the assembly he apologized, saying he was sorry he had such a small corpse for so great a crowd. Well, I regret my inability to present so great a subject as I have taken; nevertheless I am pleased to have the opportunity to say something of the work in this locality as it has impressed me this last year or so.

A shrewd, enterprising manufacturer is continually on the alert to find the machine that will do the greatest possible amount of work. If he is not personally a practical manufacturer, when he hears of such a machine he employs an expert to investigate it, and if it seems to be all that is recommended he purchases it at once. It is not wholly a question whether he can afford it, but whether he can afford to be without it while some rival manufacturer may get it and thus have the advantage of him.

When the machine is purchased and placed in his factory, then comes the additional study in finding the fastest possible speed at which it may run, without injury to the quality of the work. Finally comes the question of a man to attend the machine, or the greatest number of machines that one man can oversee. After this is ascertained and the possible capacity of the machine figured out, the employee is expected to come up very near the figures worked out by the agent and his engineer. If ten yards of cloth are estimated to be a fair product in a certain number of hours, no fault is found if he accomplishes only $9\frac{3}{4}$ yards, but if he only accomplishes $9\frac{1}{2}$ yards he is discharged and someone else employed in his place. It is only by the most careful study and the utmost crowding, so as to reduce the cost of production by increasing what one man or one machine may do, that there is any profit. But the success of manufacturing, is not entirely in having the best machinery and running it in the fastest possible way. Sometimes in mills having precisely the same kind of machinery, the difference between success and failure depends upon the way the machinery is arranged in the mill, a more convenient arrangement, saving labor and promoting the economical process of manufacturing. In some instances, prosperity and success are due to buying the raw material, as a slight difference in precentage of the waste might wipe out all the profit that there is Supposing cotton sells at 3 cents per yard, and the raw material costs $1\frac{1}{2}$ to $1\frac{3}{4}$ cents. The study of the management is to run the factory so that $1\frac{1}{4}$ to $1\frac{1}{2}$ cents per yard will pay all the labor, wear and tear of machinery and buildings, interest on any money which may have been borrowed, and a dividend on the stock. Assuming that a man trained in such a school as this was made acquainted with the fact that the average dairy cow of this country produces about 3,000 pounds of milk yearly, (and that is putting the average high), and a number of farmers through the country have herds that yield 5,000 pounds per cow, and that the annual cost of keeping a cow is say $20 and the average price of milk per cwt. is 80 cents net to him (supposing, of course, he is sending his milk to a cheese factory). The manufacturer looking into the matter would find that the man with the 3,000 pound cows, is procuring milk at a cost of $66\frac{2}{3}$ cents per cwt., and the man whose cows yielded 5,000 pounds at a cost of 40 cents per cwt. and both selling their milk in an open market where it is worth 80 cents per cwt. the one making a profit of $13\frac{1}{3}$ cents per cwt. and the other a profit of 40 cents per cwt. on his milk. Surely he would say that manufacturing would not stand such disparity of production. I think I have put the case very mildly, as I firmly believe there are cows in this country that cost their owners more than they earn. But I think the day will soon be gone when the farmer gets paid for his milk by the hundredweight; it will not be the cow that produces the large quantity, but the cow that gives the best quality of milk, and the man will get paid for the productive qualities of his milk. A great disadvantage to the industry, more particularly

the cheese business in this section, I am also impressed with. An old maxim says "Charity begins at home." Now I think if dairymen would be charitable to themselves (which I believe they think they are, but in a great many cases they are not), charitable to the manufacturer (who needs it as he has a hard row to hoe), charitable to the industry, (the true worth of it which they hardly realize, but are doing so more and more), they would co-operate and have large factories. Every sane man should know why such co-operation would be beneficial to all interested.

What state of affairs do we find in this section? It is this: That within a radius of six miles of this village we find no less than seven cheese factories with an output of about 300 tons of cheese, costing their patrons either directly or indirectly two cents per lb. for the manufacturing of their cheese. Now this quantity of cheese could all be manufactured in at most three factories, and the result would be that it could be made at about half a cent per pound less, which would be a saving of about $3,000 annually to the patrons, it would put manufacturers in a better position to employ skilled labor at a good remuneration, a more uniform article could be produced, and the quality would command a better price. Last, but not least, it would do away to a very great extent with what I call dairy corruption, (there is corruption in dairying as well as politics), such as special privileges to some who are on the boundary lines and can be bought with a can of whey or drawing their milk a little cheaper, etc.

Assuming that we have got so far towards successful work, viz., having cows which are earning owner a good profit, paying for milk by the Babcock test, and having it turned into cheese in large factories which will be a credit to the patrons, should we stop here? By *no means*. What next, then? Why, equip these factories in the fall for the manufacture of butter during the winter, and instead of having the cows go dry in the fall, feed them well and insist on them paying for their board during winter; and not alone paying for their board, but earning money. All the advantages which would be derived from winter dairying are not necessary for me to state, as every one should know them, for they have been proclaimed broadcast through our country this last two years by dairy literature, by the travelling dairies and more particularly by the untiring efforts of our Dominion Dairy Commissioner in the establishment of creameries, which have proved a success wherever they have commenced. We should be proud of it, and I know we all are, that Canada stands at the head of the world in producing a fine quality of cheese, and if we make good cheese why not good butter? The reputation of our butter in the English markets has been in the past deplorably bad. Why? Because of the manner in which it was made, and in the way it was put on the market. By some of the reports I have heard regarding it, it would compare favorably with the butter mentioned in the following story:

Among the guests at an eastern mountain resort, where all the waiters are Massachusetts school ma'ams, is a Texas man who is noted for grammatical accuracy in speaking. One day he said to a waiter "Miss, will you parse that butter?" "Butter," said the school ma'am promptly, "is a noun, a common noun, because it is the name of a thing: singular number, when strong enough to go alone; feminine gender, as indicated by the long hairs often found in it, and judging from the objections raised by boarders to eating it, in the objective case, subject to oleomargarine understood." The Texas man said he would try and get along without eating any more butter if that was what ailed it.

Butter manufactured in creameries which have been started within this last year and a half, notwithstanding it had to contend with the name of Canadian in the English markets when placed there, has compared very favorably with the finest Danish butter, and we will hope to see the day yet when our butter will have as world-wide a reputation as our cheese. Canada we are told, is a country of great resources. Why can not our dairymen do something towards developing them. We must also remember that we are not without competitors in the dairy industry, two of which are likely to be somewhat powerful, viz., the colonies of Australia and New Zealand. The governments of these countries have done all they can to stimulate the trade, and it has been further assisted by the provision of cold storage ships which ply betweed these colonies and the Old Country. Four years ago there were only six creameries in Victoria; now there are 360. The quantity of butter exported to Britian has increased from 828,822 lb. in 1889 to 4,792,613 lb.

in 1892. The Australians found out that owing to the difference in the seasons the grass-fed summer butter of Australia could be put on the English market during the months from November to March when similar butter could not be obtained from other sources of supply.

Three years ago the Government of New South Wales followed the example of Victoria in encouraging the production and exportation of butter, and it is estimated that the quantity received from the two colonies in the coming season will be over 7,000,000 lb. These facts are certainly interesting to Canadian producers. If these countries can do a successful trade with Britian though they are 12,000 miles away, surely we ought to be able to do so too as we have only one-third of the distance to send our products.

The example of these colonies is certainly instructive, and it should rouse us to fresh energy.

INSECTS INJURIOUS TO THE APPLE TREE AND ITS FRUIT.

BY O. T. SPRINGER, BURLINGTON, ONT.

The subject of my paper, "Insects Injurious to the Apple Tree and its Fruit," is one that the limited time at my disposal will admit of but a superficial notice, as the depredators are so numerous that were I to attempt even a short description of them all, it would unnecessarily tax your patience and perhaps unprofitably occupy valuable time. The subject embraces so wide a field that I find difficulty in arranging the matter of it so that you may be most benefited. I shall endeavor as far as practicable to avoid the use of scientific names or terms which might tend to obscure the sense or prevent the proper understanding of the nature and habits of our insect enemies.

With a great many people an insect is simply a "bug," without distinction or discrimination, and should be at once destroyed. This reminds one of the course said to have been pursued at a celebrated Irish fair—"Donnybrook"—hit the first head that turns up, whether friend or foe. I hope to correct this error if it should yet prevail, and show you that such a policy is a mistaken one in either case.

I shall confine my remarks to those more serious mischief-makers with which most of you (in a limited way) are already familiar; and in order to do this concisely, I shall divide my subject in the usual orthodox manner into several heads or divisions.

Firstly (as it is always good policy if practical to begin at the foundation), I shall treat of insects injurious to the roots; secondly, of those affecting the trunk and branches; thirdly, those attacking the twigs and leaves; and, lastly, those destructive to the fruit. In following this plan it is my purpose, after giving a short description of the most destructive of these pests, to state, so far as I know, the remedy to be used to combat each successfully, so that the trouble and cure may be in juxtaposition. It is foreign to my purpose to attempt to name or describe all of the eighty or more injurious insects known to entomologists that prey upon the apple tree and its fruits.

Do not misinterpret or view me in the light of an alarmist on account of the foregoing statement of numbers, as, fortunately for us fruit-growers, many of these are so preyed upon by other friendly insects that no serious injury results. Occasionally, however, the balance in nature, from some unknown cause, seems to be disturbed; then one or more of these our insect enemies increase to an alarming extent, and almost, if not altogether, baffle our tact and skill to keep them in subjection. Before proceeding further, I wish to acknowledge my indebtedness to the excellent entomological works of F. W. Harris, of Boston, and W. Saunders, of London, for details of insect life, and would strongly urge any who may wish to pursue this subject to obtain them for their own use. They are very practical and clear in description of the various insects with which fruit-growers and gardeners have to contend.

Enemies of the Roots.

There is but one foe of any consequence to contend against, and this, although widely disseminated, seldom proves sufficiently troublesome to excite alarm. I refer to the apple root plant louse. If you at any time notice a tree that, from no visible

cause, appears to be dying or making a very feeble annual growth, you may suspect the presence of this insect. If, upon removing the earth from the roots, they are found covered with warty growths, or if they are unnaturally roughened, the cause will be found, upon closer examination, to be myriads of small yellow lice accompanied by larger winged ones; these are all busily engaged feeding upon the natural juices that should go to sustain the vitality of the tree. They are usually covered with a white cottony substance, and, when very numerous, appear above ground upon suckers from the roots (if they have been allowed to grow), and sometimes may be detected where a large limb has been cut off near the trunk, attracted thither by the exudation of sap. It is then known as the woolly aphis. The most successful remedy is the use of water at almost the boiling point, if applied to the roots while remaining in the soil; but, if applied to young nursery stock before planting, the water should not be over from 120 to 150 degrees Fahrenheit. There are several friendly insects that prey upon these lice under ground, and the lady birds destroy many of them above the surface.

Insects which Attack the Trunk and Branches.

There are six insects in this class. The round-headed, flat-headed, and long-horned borers, eyed elater, stag beetle and rough osmoderma. I shall notice three, as the others are comparatively rare, and seldom cause trouble. The round-headed borer is widely distributed. Its destructive character was first observed near Albany is 1825. It prefers the apple, but also makes its home in the pear, quince and mountain ash. The beetle is very handsome: of a pale brown color, $\frac{3}{4}$ of an inch long, with two broad, creamy-white stripes the whole length of its body. It appears in June or July, remains concealed during the day, and is active at night. The eggs are deposited about this time, singly, in crevices of the bark, near the base of the tree. Within two weeks these hatch, and the young larva commence their three years' life before reaching maturity. The first year they may be found in the sap wood and inner bark eating round places therein varying in size and filled with brown, fine castings of the destroyed woody fibre. Their presence is known by dark spots appearing on the outer bark, which sometimes cracks and permits sawdust-like castings to escape. During the second season its depredations are sometimes very great, two or three of them completely girdling a tree, thus causing its death. At the end of the third season, if permitted to complete its work, the larva cuts its way into the solid wood of the now enfeebled tree, occasionally entirely through it, closing the ends of the passage thus made with the pieces of wood cut away. In this retreat it remains until the following spring, when, after undergoing the usual insect changes, it emerges a perfect beetle. The larva is whitish, has a round head, chestnut brown in color, with polished black jaws, is without feet, and over an inch long when fully grown. Remedies: Scraping the bark in August or early September, when the discolored spots will betray the presence of the enemy, where it may be easily reached in the clear, white wood with the point of a knife. A flexible twig pushed into the holes made by the perfected larva, or hot water injected therein, will reach the more mature insect. The best preventative measure is a strong solution of soft soap (rendered alkaline by the addition of common washing soda in solution) applied to the trunk early in June and a second time in July. This application forms a tenacious coating not easily washed off, and is repulsive to the insect, thus preventing the deposit of eggs.

The flat-headed borer, also a native insect, is very active, and, unlike the one just described, revels in the light, and particularly enjoys the bright sunshine. It is very difficult to capture, and takes flight upon the slightest alarm. It is of a flattish, oblong form, shining greenish-black color, under side of body and legs like burnished copper, the feet brilliant green. It is very widely disseminated, does not confine itself to the base, but attacks the trunk and large branches, and appears in Canada during June and July. The eggs deposited on the bark hatch in about ten days. Then the young larva eats its way by irregular winding channels through the soft inner bark, sometimes completely girdling a small tree. The mature larva is a pale yellow, footless grub, with anterior end much enlarged, round, and flattened; hence its name. It is not definitely

known now how long time is required for its perfect transformations, but it is thought they are completed in a single year. Sickly or newly-transplanted trees are more subject to attack than sound, healthy ones. They attack the south-west side, where the bark is often affected by sun-scald, or in mature trees, the upper side of large limbs towards the north, where the sun beats perpendicularly, or nearly so, upon them. As a preventative measure there is nothing better than the alkaline solution already described applied to the trunk and branches.

The last enemy under this head is the long-horned borer, which appears about the last of August, with habits very similar to the two-striped round-headed borer, but does not penetrate the solid wood. It is seldom very destructive; should it prove so, the wash referred to, deferring the application until the early part of August, will be sufficient to check its ravages.

Insects Attacking the Branches.

These are about fourteen in number, two of which are sometimes annoying to the Canadian fruit-grower, viz., the woolly louse and the oyster shell bark louse. The woolly louse is the same species as the apple root louse before described, but in this form the insects attack the trunk and limbs of the tree, living in clusters, and secreting over themselves a cottony covering. They are often found about the base of trees, and, when very numerous, on the under side of branches, giving the tree the appearance of having been whitewashed. They should be destroyed before the month of October, as they are wingless before this time, and do not spread from tree to tree with any degree of rapidity, but if neglected and allowed to spread by flight, serious injury results, and the work of extirpating them is greatly increased. The use of a stiff brush wet with a solution made by mixing 5 lb. of fresh lime with 1 lb. of sulphur and 2 gallons of water, heating until the sulphur is dissolved, or the alkaline solution, are excellent remedies.

The oyster shell bark louse is a very pernicious insect, and prevails very generally throughout Canada. It was introduced from Europe about eighty years ago, and appears in the form of minute scales about one-sixth of an inch long, of a brownish or greyish color closely resembling the bark of a tree, somewhat resembling the shell of an oyster in shape, and adheres to the bark; irregularly placed, with smaller end uppermost. Under these scales are found masses of eggs, up to one hundred or more in number. These eggs are at first white, and afterwards become yellowish. Soon after this change the perfect insects appear, usually late in May or early in June. They then disperse over the tree, and when very numerous seriously impair the vigor if they do not kill it outright. Remedies: A species of mite preys on both the louse and its eggs; also, a small, active larva is found under the scales devouring the eggs. The twice-stabbed lady bird, in beetle as well as larva form, destroys great numbers of them. The scales may be scraped off during winter, thus very materially aiding in the good work. When the young larva are active, any alkaline solution applied to infested limbs will quickly kill them. One-half lb. of washing soda in a pailful of water is sufficiently strong; painting with pure linseed oil is also said to be very efficacious. It is almost useless to apply any solution before the eggs hatch, as the scale adheres very closely to the bark and is waterproof; but once the eggs are hatched, it then becomes loosened, and washing or syringing the trees destroys the young insect.

Insects Attacking the Leaves.

This is a most formidable class, fifty insects being enumerated. Those most frequently met with are the tent caterpillar, forest caterpillar, canker worms, fall web worms and apple tree aphis. The tent caterpillar is probably well known to almost every one present. To this family belong the caterpillars that swarm in unpruned nurseries and neglected orchards, and that spin their webs upon wild cherry trees that grow by the wayside. The eggs from which they are hatched are placed in the form of a ring or cylinder around the terminal branches. The eggs forming these cylinders stand on end close together, and are covered with a thick coat of waterproof varnish. The

caterpillars appear when the young leaves first burst forth in May, and their presence may readily be detected by the small silken tent stretched at the limb forks, to which they retire when not eating or during cold or wet weather. After attaining full growth they leave the trees, find some sheltered place, spin a long, regular, oval-formed cocoon, very loosely woven, covered with yellow powder resembling sulphur, from which, after a period of 14 or 17 days, emerges the perfect insect in winged or butterfly form. This pest is easily kept in check by removing the rings from the trees during the winter or early springtime. A practiced eye readily discovers them. Or by going through the orchard in the early morning, or in the evening when the caterpillars are in their tents (which at first are very small), they may be effectually dislodged by crushing nest and all with the hand protected with a rough glove or mitten. This is somewhat repulsive labor when the tents are large and the insects fully grown, but if done early the glove will not be dampened to any great extent, particularly if a little earth be used in contact with the web. Some orchardists shoot a charge of powder through the tent and rub them off with a bunch of rags tied to the end of a pole. Others burn them with a kerosene torch. But if taken in time the first-mentioned process is quickest and best. The nests are so conspicuous that there is no reasonable excuse for neglecting this public duty, as one neglected orchard may be the means of distributing this pest over an entire neighborhood. I have banished them from my orchard by a little timely vigilance, therefore speak from experience.

The forest caterpillar is very similar to the tent caterpillar, but differs somewhat in its habits, although appearing about the same time. It does not spin a web of such large size, neither does it return to it at night. The eggs are white, deposited in similar order and place as the preceding described insect; the young caterpillars are fully formed therein before winter, and remain in a torpid condition until the following spring. From the time they are half-grown until they attain full growth they may be found crawling about in every accessible place—over fences, sidewalks and trees of all kinds. This excessive activity increases the difficulty of extirpating them, yet the alert fruit-grower may destroy countless numbers of them by taking advantage of a congregating habit peculiar to this insect. The caterpillars feed during the day and congregate in large masses, when numerous, on the trunk or lower side of the large limbs, from which they may be swept into some suitable vessel containing a little oil, which quickly kills them. Some preventive measures are the removal of the egg cylinders; tying a strip of cotton batting around the trunk of the tree during the summer season prevents the caterpillar ascending by entangling its hooked prolegs. Care must be used in applying this strip; it must be tied around the middle with a cord, so that it may hang over, thus preventing the compacting or hardening of the cotton by the action of the rain.

The canker worm, which is now making its appearance in this neighborhood in destructive numbers, is a very formidable enemy, and requires vigorous and unremitting attention to prevent its ravages. There are two kinds—the fall and spring—but the habits of both are so very similar that a description of one variety will (so far as the design of this paper is concerned) suffice for both. They are popularly known by the names of geometers, span worms and loopers, or measuring worms, from their peculiar method of locomotion, it being accomplished by a bending upward or looping of the back and alternating forward motion of the forward and hinder segments of the body; as if measuring the distance as they travel from place to place. The larva varies in color from a bright green when first hatched to that of a mottled or banded brown closely resembling the bark of the tree upon the leaves of which it feeds. For this reason (when at rest) it is quite difficult to find; this difficulty is further enhanced by a peculiar habit of attaching itself to a twig by its hinder segment and arranging the body at an angle of nearly 45 degrees, therewith appearing in this position very much like a spur or short branch.

The eggs of both species hatch in early spring, on the first appearance of leaves; the young larva are quite hardy, and will live through quite a severe frost, secreting themselves within the unexpanded buds or at the axils of the leaves. These caterpillars have a curious habit (when disturbed) of spinning down from the tree on a fine thread to a distance of two feet or more, there remaining motionless for a short time.

Should the disturbing cause cease, they attempt (and always succeed unless interfered with) to regain their former position on the tree by a peculiar backward and forward movement of the body, accompanied with a simultaneous motion of the legs, which combined movements effect the winding-up of the thread. The caterpillar when fully grown is an inch or more in length ; it reaches maturity about the middle of June, when it suddenly disappears, having let itself down by its silken thread. The cocoon remains dormant until after the first frosts in the following autumn, usually until about the last week of October ; should a few warm days occur, the insects of the fall species, and a few of the spring as well, come forth and make their way towards the tree. Fortunately, the female of both species is wingless, and any method that will prevent her climbing to the branches of the tree or capture her on their way, will prove of great service. Advantage is taken by this wingless feature by practical men. Bands of sticky substances two or three inches wide are painted around the tree trunks, thus entrapping them. The substances commonly used are printers' ink, a mixture of pine tar and oil, or any other sticky substance or compound that will not dry quickly. It is best to apply such compounds upon a belt of paper about a foot wide, closely fitted about the trunk, as injury is sometimes done the tree by very frequent applications. All applications of this nature should be seasonably applied and renewed occasionally until the danger is passed. Other preventive measures take the form of collars of metal surrounding the trunk like cones, the lower edge being kept some distance from the trunk. Troughs of tin or lead filled with fish oil have also been advocated. Syringing the trees when in leaf with a mixture of Paris green and water in proportion of $\frac{1}{4}$ lb. to 40 gallons is very efficacious if done early in the season.

The apple tree aphis aphides, or plant lice as they are commonly called, are amongst the most extraordinary insects. They are found upon almost all parts of plants : there is scarcely a plant that does not harbor one or more kinds peculiar to itself. They are very prolific; it has been proved that one individual in five generations may become the progenitor of millions of descendants. In the case of the apple tree the eggs are deposited upon or near the leaf and fruit buds, as well as in crevices of the bark, are of oval form, very minute, and shining black in color. They are deposited in the autumn. As soon as the buds begin to expand in the spring these eggs hatch into tiny lice, which locate in the swelling buds and young tender leaves, inserting their beaks therein to feed on the juices. The leaves on infested trees in time curl backward, thus affording shelter for the enclosed insects, where they may carry on their work in comparative safety, undisturbed by wind, rain, or sun. The tree soon presents a withered appearance, owing to the extraordinary strain to which it is subjected by this misappropriation of its juices. It has been stated that the scab on the fruit is primarily caused by the punctures of this insect. I am inclined to attribute this trouble to an entirely different cause, believing it to be a fungoid growth disseminated by spores, which are carried by the wind, and once finding a lodgement on a tree, are perpetuated from year to year by spores retained upon the limbs and shrivelled specimens of fruit that are frequently left hanging. A close observer will notice that ants are always found in large numbers on trees infested with plant lice ; they are attracted by a sweet, honey-like liquid ejected by these insects, which is sometimes so plentifully secreted as to cause the appearance of what is termed honey dew. This phenomenon is not, however, always to be attributed to this cause. Many interesting stories are sometimes related as to the protection afforded the plant lice by ants, which are said to keep insect enemies at bay in order that they may have undisputed possession and sip their nectar undisturbed. Plant lice are preyed upon by a host of insect enemies ; amongst the most serviceable is the whole family of lady birds, of which there are nine different kinds. These insects always should be carefully preserved, as they, in both the larva and mature beetle state, live entirely upon destructive insects. A slight frost occuring about the time the young lice hatch in the spring will kill millions of them, as they are very susceptible to cold. Syringing the trees about the time the buds are bursting with strong soap suds, weak lye, or tobacco water is said to be beneficial.

Insects Attacking the Fruit.

Seven are enumerated. I shall notice three only, as all the others are rare and do not as yet trouble us here. The codling moth has proved the most destructive of all insects in this class. It originally came from England. This insect makes its appearance in the spring in the winged state about the time the blossoms are falling, and deposits an egg in the calyx or blossom end of the young apple which is just forming. This egg produces a small worm, which eats its way into the pulp of the fruit, in which it remains until it is fully grown. This is in our climate about the 10th of July, when, should the diseased apple not fall, they leave it and crawl down the tree, enter the ground, or hide in cracks and rough bark of the trees, and spin their cocoons, from which they emerge in a perfect winged form to again attack the developing fruit. This second brood causes the most injury, as the larva destroys the maturing fruit by eating channels and holes in the pulp, thus rendering it unsaleable. You may frequently have heard the remark about the 1st of July, "Have you noticed how rapidly the apples are dropping?" and all the blame attributed to the dry weather. That is in a measure the true cause, but the greater part of the mischief is caused by the work of this insect, and should you take the trouble to examine the fallen fruit, the true cause may be readily seen.

There are several methods of combating this insect. Allowing pigs or sheep the run of the orchard has proved in some instances quite successful, by securing the early destruction of the fallen fruit. Using bands made of old gunny bags or similar material cut into strips six inches wide, doubled and long enough to go around the trunk just below the branches. This band may be fastened by driving a tack through the overlapping ends. I have found a thorn from the common haw tree the best fastener by using it in the same way that you would a large pin, over which it has the great advantage of never rusting, and will always easily penetrate any material suitable for this use. These bands should be on the trees not later than the 1st of July, and ought to be carefully examined every two weeks thereafter until the close of the season. At each examination numbers of the larvæ will be found adhering to the band between the folds or between it and the bark, where, if the band has been tightly drawn, as it always should be, the larva will eat away a place in which to spin its cocoon. Of late years it has been customary with many fruit-growers to spray the trees with a mixture of Paris green and water in the proportion of $\frac{1}{4}$ lb. to 40 gallons of water. This is quite strong enough, and must be done before the apples are too large or depend from the stem; when the fruit is the size of marbles is the best time. The theory is that the poison will reach the newly-hatched larva in the end of the apple and cause its death. Should heavy rain occur soon after spraying, it is advisable to repeat the operation, as the eggs are not all deposited at the same time, and therefore do not hatch simultaneously.

The apple maggot is a new enemy occasionally found in our country that has proved very injurious to the states of Massachusetts, Connecticut and New York. It is footless, tapering to a point in front, cut squarly behind, greenish-white in color, one-fifth of an inch long, lives in the pulp of the apple, making winding tunnels, with here and there enlarged, discolored places about the size of peas. This insect is single-brooded, the fly appearing in July. By means of a sharp ovipositor it inserts its eggs into the substance of the apple, preferring the thin-skinned summer and fall to the thicker-skinned winter varieties.

The last fruit-destroyer I shall notice is the rose chafer, commonly called rose bug, which is very voracious, and attacks all kinds of fruit without partiality, anything green not coming amiss. I have found it very destructive to young corn plants, and it is also fond of the Clinton grape. Although they have many natural enemies, they often require the intervening hand of man to keep them in check. I do not know of any wash or solution that, applied to the foliage of fruit, will act as a repellant. A weak, aqueous solution of carbolic acid has been recommended. Hand-picking is the only sure method. As they are gregarious and sluggish in habit, an active boy with a pan containing water and oil will destroy many thousands in a day.

I feel that by this time you must be weary of so dry a subject, and are inwardly wishing that I would stop. I quite agree with you should this be your wish, and think that if you remember one-third of what I have, in an imperfect manner, been trying to lay before you, you may have gained a little benefit in exchange for this tax upon your patience. Not that anything particularly new has been said, but established facts have been brought before you, which, if acted upon, cannot fail of marked beneficial results, and enhance the value of our fruit crop. It has been said that eternal vigilance is the price of liberty. I feel safe in adding that it is also the price of superior fruit.

DEHORNING.

BY ROBERT SHAW, GUELPH.

This is a subject which has received much attention of late owing to the increasing tendency for stockmen to use artificial means in removing the horns from the cattle. After the practice had been found successful it increased very rapidly in many parts of the United States, and soon found its way into Canada. Its course in Ontario, however, was checked by legal action against some who carried on the work. Of the most notable cases that which occurred near Brownsville, in Oxford County, was perhaps the most interesting in which a stock raiser was prosecuted for dehorning by a Society for the Prevention of Cruelty to Animals; the trial resulted in the imposition of a fine. These measures however, failed to put a stop to dehorning. Those who had experimented continued in a quiet way to dehorn their cattle, while those who had not tried it were led to experiment.

Those who proclaim against dehorning, argue that it is an unnecessary, cruel operation, and should not be allowed. In some instances horns are ornamental, and in some countries in a state of nature they are useful for protection. But in a domesticated state horns are entirely useless to the animal and certainly very injurious at times, being employed to injure one another. They are not only injurious to each other, but bring about bad results to their possessor, because finding he has weapons wherewith to assail others, he neglects his proper business of eating and drinking to interfere with others, keeping them away from food and drink. As a result, the offender is constantly more or less excited and uncomfortable, which state is detrimental to the production of flesh or milk as the case may be. Deprived of his horns he becomes quiet, not liable to excitement, he eats, drinks, sleeps, enjoys contentment and becomes fat.

Those in favor of dehorning claim that although the operation may cause considerable pain at the time, it is not lasting, and in proof of this statement cite the fact, proved by experiment, that milch cows after dehorning, if properly treated, do not evince any loss in flow of milk.

Now if we are justified in dehorning as I think we are, in some instances, but perhaps not in all, the benefits arising from it are certainly very numerous and of much importance to the farmer. It is a common occurrence to notice newspaper reports of injury, and often death, to attendants and others from attacks by vicious bulls.

Although bulls of the hornless breeds may possess equally vicious tempers, still when they make an attack they have not the weapons wherewith to perform the terrible havoc of the horned animal. Those who have had experience with vicious bulls tell us that after removing the horns from them, they are so reduced to a docile condition that almost any person can manage them with safety. Knowing that such results can be attained we can use the means to good advantage; for instance in the case of a very valuable animal possessed of rare qualities, the temperament, if ugly, may be so changed that his life and usefulness may continue, while otherwise, it would be necessary to send him to the block. Now do not mistake that I am recommending breeding from ill dispositioned, for there are even some exceptions, granting that dehorning affects markedly the disposition. Some cry out against dehorning bulls that afterwards they may become very quiet and take on more than a normal quantity of fat, thus becoming impotent. This is not likely to occur. If there should be any danger of it, avoid such by proper changes of food and if necessary resort to the tread power or some form of work.

In dehorning milch cows, the tendency is to affect favorably their temperament, resulting in an increase of milk in proportion to the food fed. It is necessary that quietness should exist among dairy stock in order to obtain the very best results. The same rule will apply in the case of beef animals where a rapid production of flesh is desired. This being the case, then it must necessarily follow that dehorning is advantageous. Where animals are allowed to come in contact with one another, their attitude to each other must have some effect on the success of the object aimed at. If the animals are kept in a state of excitement and fear, it certainly must follow that a portion of the food given to them will not fulfil the office intended.

Then again when the beeves are ready for the market, they are in much better condition having whole hides and unbruised flesh, both of which sell more promptly and at much better prices, while the cost of transportation of the live animals is much less because a larger number can be packed in each car.

Having touched on a few of the advantages connected with dehorning we will proceed to discuss the time, manner, etc., of operation. Some are led to look on this operation with horror more from want of an accurate knowledge of the structure and anatomy of the animal than from real sympathy, believing that the horn structures are exceedingly sensitive and closely related to the brain. It is true that they do possess a certain degree of sensitiveness, but not to the degree which some imagine who talk of "cruelty in cutting through the exquisitely sensitive marrow of the horn core." Now it may be affirmed safely that sound adult horned cattle have normally hollow horns, but that this is not caused by disease and that there is no disease properly so called. And in regard to their nearness to the brain and connection with it, a study of anatomy will show that it is not as intimate as many suppose. For instance a belt three inches broad including the whole top of the head would not include the brain. So the horn posesses no great degree of sensitiveness being intended for great exposure or hard usage and violent blows.

There are two modes of dehorning, a chemical and a surgical. The agents used in the former are caustic, alkalies and mineral acids, in the latter the knife and saw, in addition to which the Americans have added two other instruments invented for the purpose and advertised in their agricultural papers.

The saw to be used should not be very long nor weak. One with a reinforced back such as tenon saws have is preferable. The work should be performed with rapid long strokes A punch or gouge should not be used in operating on young calves.

We consider the proper time to dehorn is when the animals are young. On the head of the calf is a small button-like hairless spot which is movable. After a few weeks a small tubercle may be felt under the skin resulting from the absorption within, extending the frontal sinus, the deposit taking place just beneath the skin, thus forming a horn core. Using a small knife, remove this tubercle along with a border of one quarter of an inch of hair-covered skin and the work is done.

There is little loss of blood, the periosteum, which secretes the tubercle, and the portion of skin which secretes the horn, are removed with little pain to the calf and it is well in a few days. The operation on older cattle is more difficult. However, it may be performed on cattle of any age with little danger or injury. The severance may be made at any distance from the skin, but as a rule the nearer the head the better. In this case there is some danger from hemorrhage, proceeding from an artery situated at that part of the horn near the ear. Consequently plugging the sinus in the centre of the horn stub would be useless, but a solution of persulphate of iron thrown into the artery or introduced with a pointed instrument instantly forms a clot, checking the flow of blood. Or a bandage tightly applied around the head above the ears pressing on the arteries would suffice.

Regarding the appliances used to hold the animals. Calves may be held by two or three assistants, allowing the calf to remain in a natural position or by placing it on its side on a suitable platform. It is not deemed advisable to cast older animals, violent struggling usually occurs with much waste of time. A narrow stall with very little labor can easily be arranged for the purpose, in which the animal may be secured by a bar across the loin or hips, another behind the quarters, one touching the thigh and belly and one against the breast. The body now being rendered immovable, secure the head to a strong post in front, after which the operation may be easily and speedily performed.

Of the chemicals used, caustic potash is probably the most common and may be used as follows: As soon as the buds of the horns appear in a calf or can be found, secure an ordinary stick of fresh caustic potash. After moistening the horn buds with water, rub the exposed horn with the end of the stick of potash. It requires but a slight application to kill the young horn and causes very little pain.

Now is not the stockman justified in dehorning cattle both from a personal and financial standpoint? And may we not add, that he should be from a merciful view of the subject. The horns of the stronger are a terror to the weaker animals which are deterred from food, drink and rest; persecuted, gored, bruised, excited in a tyrannical, cruel manner, appealing powerfully to the merciful owner for relief. "For the righteous man regardeth the life of his beast."

The subject of dehorning has become a very important one in many parts of Ontario, and is attracting much attention, aeven to the extent that where its propriety was disputed, the Government appointed Commission to examine into the matter carefully. The conclusion which they arrived at was that it is justifiable, and that the advantages to be derived from it are numerous and important. And now that no obstacle lies in the way may we not safely predict that in a few years dehorning will have become a common practice in Canada.

TIDINESS ON THE FARM.

BY C. U. HOLMES, SELKIRK.

It is generally conceded that the present conditions, habits, customs and appearances on the farm are not favorable to the growth of an agriculture loving race. They are likewise not creditable to Canada as an agricultural country. I am speaking principally with regard to outward appearances. I don't need to mention the great question which ought to agitate the minds of all men in our country from the schoolboy to the statesman. It is the disposition on the part of every one to flee from agriculture as from a raging pestilence. Horace Greeley in one of his celebrated lectures on farming, said: "I perceive that the present conditions on the farm have driven many an American boy away from it and I glory in the fact."

Men, and boys especially, are creatures of influence. We are largely moved by what is brought to bear upon us. We form our opinions of things and persons by their general effect upon us, and just so surely as we neglect this principle just so surely will somebody or something be sacrificed.

In setting out to discuss the subject of tidiness on the farm let me ask the questions. Why should the farmer keep his farm tidy? What features must be observed in keeping his farm tidy?

In answer to the first question I need scarcely say that it will enhance the value of his property. Good, well kept, tidy, well situated, well planned farms, are always in demand at good prices, let the state of agriculture be as it will. It will be a source of satisfaction to the farmer himself. "A thing of beauty is a joy forever." It will have an educative influence upon his family and neighbors. The farmer may in this way be accomplishing a work so great and so far reaching as to cause the angels to wonder. It will create a bond between the boy and the farm.

In answer to the second question I propose to treat of a few of the leading features which the farmer must observe in keeping his farm tidy and under this head shall first deal with the subject of building. In selecting a building spot the general effect of the location upon the whole farm should be considered, as well as the suitability in other respects. The merchant displays his goods in the most catchy manner; the farmer should select his building spot for effect.

Then the style of house must next be considered. There seems to be a disposition on the part of the farmer to adhere to the style of house building in vogue in the days of their great grandfathers, oblivious of the fact that architecture has undergone a complete revolution during the last quarter of a century. Why should not the farmer live in as tasty a dwelling as anyone else? Taste does not imply expense. A neat modern

style of house will cost no more than the barn-like structure so common on Canadian farms. It should be so planned as to be easily heated, cosy and comfortable. I pity the farmer who has to live in the kitchen and who has not a lounge he may cast himself upon while he rests and calmly meditates. Then the *Home*. Oh, sacred name! Mother of every uplifting influence. Cleanliness and beauty should guide the housewife's every action and a collection of books, however small, should be a leading feature in every farmer's home. Don't forget that books were made for use, and that rooms are made to live in, not to be shut up during the week to be opened on Sundays.

Every farm should have a well kept lawn and flower garden. It costs little work and less money, and will be a source of joy to all. He should aim to increase his selections of flowers and not be satisfied with the ordinary kinds. It is novelty and change that give interest to any pursuit. Then the fence around the lawn should be tasty selected with a view to effect as well as use. The handy farmer could make such things as this during the winter. Every farmer, and indeed every one, to succeed must learn to be handy and adapt himself to circumstances.

No lawn is complete without well kept ornamental trees, and variety and novelty in this respect will also lead to interest. As to the wood pile, there should be none. Any farmer can construct a woodshed.

In the matter of barn building, I think the present style might be wonderfully improved, especially in the line of greater convenience in feeding and stowing away grain, as well as in appearance. Why should we adhere to the systems of a century ago?

Stables should be so arranged as to render feeding possible with the least amount of labor and loss; fodder should not cover the floor and yard. In building it seems to me the custom is to put up the frame and do the planning afterwards. I would suggest a reversal of this. The old fashioned shed with the three openings in front is an anachronism, which has been responsible for many a shivering and injured brute, wherein the monarchs of the yard chewed the cud at ease. Why not make stables of it, and save feed and give comfort to your animals?

The silo is a very important feature in the farm buildings, without which no barn is complete. It is surprising the few there are in this section, and is probably owing to the fact that stock raising is not very extensively practised. Acknowledging this fact, it would pay every farmer with an average stock to put one in his building, that is if he makes use of it after it is there. A silo might be very cheaply built, and should be so arranged that fodder may be easily got to the animals to be fed. The nearer it approaches a square the less material will be required to build it and the more space obtained. Either rye or corn make a good silage. Both of these, I believe, can be grown very successfully here. It is now considered preferable to cut the corn before putting it in the silo. The corn in the silo should be tramped and spread to secure evenness in settling and uniformity in quality. It make a good cheap food in conjunction with a little hay for young and fattening cattle, milch cows, colts, brood mares and sheep.

The driving house should have a separate place for rigs so that when you drive out your vehicles are not covered with hay seeds, suggesting your occupation. All buildings should be painted. Cheap paints can now be obtained and put on by the farmer himself when farm work is not pressing.

One thing I have noticed in connection with farming is the lack of the appearance of permanency, suggesting the Micawber-like intention of only remaining at the business until something else turns up. The farmer seems to do things just for the present.

In the matter of stock there can be no real interest in or attachment to an animal unless he be well groomed, well fed and handsome. Cattle as well as horses should be groomed. This well benefit the animal as well as please yourself. Make manure in the stables. Let the animals be well bedded and clean.

Dairying in winter is unpleasant to the farmer on account of the stables, etc., being untidy, while straw may be going to waste in the yard. Let the stable be so arranged so that little will fall away from animals.

I believe there is no other drain upon the farmer's pocket so heavy and constant as the expenditure for implements. This is largely due to carelessness in housing and repairing. The old adage, "a stitch in time saves nine" is worthy of consideration. Let all implements be kept painted and in good repair that whether the farmer goes to the field or drives to market his rigs and implements may be a source of pride to him.

The zig-zag fence must soon take its departure, for it is an unsightly affair, detracting greatly from the general appearance of the farm. The wire fence is dangerous and not very effective. The rail fence is constantly needing repairs. The hedge fence is ornamental and effective, and possesses the advantage of permanency. Almost every farmer could afford to build 40 rods or so per year, and thus by easy stages fence and beautify his property. Every field should have a gate; not the heavy board structure so often seen, but a light, strong structure of knitted wire, etc., on a wooden frame. This could be made by the farmer in the winter instead of toasting his toes on the stove at the village store. Fences should always be kept in good repair. This takes work. Yes, the zig-zag does, but I would discard that at once. There are many forms of straight rail fences that answer the purpose of the zig-zag and do not detract as much from the appearance of the place.

Don't plant your orchard in front of the house. The house is the leading feature on the farm and should not be obscured. Plant trees in regular order, and keep them well trimmed; a day's work will trim a large number of trees. Plant nothing but choice fruit, and plant a variety. Don't be afraid of wasting your land when setting out trees and crowd them. It is claimed by those of experience to be the most profitable source of income on the farm. Why neglect it?

A farm infested with weeds is abominable. It is certainly impossible to keep a farm entirely clean from these things, especially when we have neighbors who are a little more careless about their destruction than we are ourselves. Do not misunderstand me by thinking I consider it impossible to destroy weeds; on the other hand I would have you believe that there is no weed growing but may be eradicated. The grounds that I take for stating that it is impossible to keep the farm entirely clear from weeds is that there are so many weeds the seeds of which are attached to a downy substance and are thus carried by the wind to light as probably on our farm as on our neighbor's from whence they came. Another conveyance by which the weeds are transported are the ditches which run from our neighbor's farm through our own and unless we get our neighbor to join with us in their destruction those fields can never be cleaned. Weed eradication requires very careful watching, for just when you think you have them mastered they may spring up as bad or worse than before. For instance, supposing we were to run short of grass seed this spring, it would be necessary for us to go and purchase such seed as we required for our spring seeding. The seed that we buy is full of weed seed. We sow it on our land, but much to our discouragement there is a crop of weeds instead of grass. A lesson that we can learn from this is: Use careful judgment in all the seed we sow, particularly if it be purchased seed, and a way to overcome the difficulty is to join with three or four of our neighbors who are responsible men to make sure that we are never short of any seed when it is required. I have chosen four different weeds that I think are the most troublesome in this section, and will endeavor to give you a simple but effective mode of destroying them.

At the head of the list is the Canada thistle, which, although one of the most dreaded of our weeds is not the most difficulty to destroy. The great secret in the thistle eradication is to never allow it to be far above ground at a time as their breathing power is in this way destroyed. The principal modes of destroying the thistle are:

(1) By means of the bare fallow; (2) by means of a bare fallow in conjunction with a green crop; (3) by means of a heavy crop of clover.

With the bare fallow, the procedure would be as follows: Plow shallow early in autumn, turning under all the portion above ground without disturbing the horizontal roots. Plow again shallow in spring before the young plants are far above ground. During the remainder of the season use some form of cultivation that will cut off all the plants as often as may be necessary. Buckwheat is the principal crop grown in conjunc

tion with the bare fallow in destroying thistles. The advantage of this method consists largely in the fertility which is thus brought to the land, and in the improvement of its texture. Two crops of buckwheat may thus be grown in a single season.

Wild mustard is one of the most difficult weeds to eradicate, owing to the enormous number of seeds it produces and to their extraordinary vitality. Four things require careful attention in conflict with this weed :

(1) Cultivate so as to start the young plants as often as possible.

(2) The efforts to destroy them are best made early in the season, though much may be done also in autumn.

(3) Allow none of the seeds to mature.

(4) Drop spring crops out of the rotation as far as possible.

The principal modes of destroying wild mustard are :

(*a*) By means of bare fallow followed by a hoed crop.

(*b*) By means of a rotation consisting of the bare fallow, winter wheat, hay and a hoed crop.

By the first method, plow, cultivate and harrow as frequently as necessary during the season and the autumn preceding. Keep the seeds from ripening during the season of the hoed crop and cultivate as frequently as possible.

By the second method, cultivate as in the first instance and sow grass on the wheat either in autumn or the following spring—when the plants are well subdued ; hand-pulling must be resorted to as long as necessary.

Pigeon weed is an annual with a red root which is troublesome on autumn sown grains, meadows and pastures. It prefers light soils and is propagated by being conveyed in winter wheat for seed and by birds. The modes of destroying it are : Drop winter wheat and rye out of the rotation for a time. Cultivate hoed crops as frequently as possible. Give careful attention to autumn cultivation in the infested fields after the grain is harvested. Invariably follow the roots crops with a spring crop sown to grass. Pull out any plants found in the meadow, pastures or autumn grains. Use much care in purchase of winter wheat intended for seed, also of the seed of mammoth and alsike clover. Use the bare fallow where the soil is not suitable for growing rape.

Rag weed is late in its habits of growth, the seeds not usually ripening before the latter part of July and on until the time of fruit. It will grow in any soil, but is very partial to loams which are rich in humus. It is propagated in the seed of common clover, in the excrement of animals, by means of watercourses in time of high water and through the agencies of birds. The remedies are : Drop late grain crops and the common clover as far as possible out of the rotation ; give careful attention to autumn cultivation in the grain fields and also in the meadows and pastures which are to be plowed. When hoed crops are to be cultivated, have them kept clean of rag weed late in the season. In newly sown meadows the mower may be run over the fields before the seeds ripen in autumn. Pull out any stray plants in fields not otherwise cultivated.

THE IMPROVING OF WORN SOILS.

BY J. H. BEST, BALMORAL.

The subject I thought of writing a few ideas upon is the improving of worn or over-cropped soils. I do not mean to say worn out soils, for I am pleased to notice that there is not much of that kind of land in this locality. In most of the soils of this kind, the plant food is not available or soluble ; therefore for all practical purposes it is the same as if it were really exhausted ; but the skilful management of the farm can bring it back in part, if not in full, to its original fertility. The whole art of agriculture depends greatly upon this skill of keeping up the fertility of the land, and at the same time raising good crops. A worn-out soil is scarcely worth the trouble and expense of reclaiming or improving. Different soils require different management. Heavy clay soils that are inclined to hold the water obstinately, caused by long cultivation, require draining, for

air and water cannot occupy the same space at the same time; and it is necessary to have the air to circulate through the soil, as it receives a great portion of its fertility from that source, by bringing the organic matter that is left in the soil in such a shape as to be useful to the growth of the plant.

It is true that a sufficient quantity of organic matter applied in the form of manure or clover, corn or any other green crop—even a crop of Canada thistles plowed under—may immediately improve it; but without draining, a great portion of this is wasted. Therefore, for this class of soils just described, draining appears to be the first process of making a worn soil fertile. Light or sandy soils do not require the draining. The principal object of the farmer is to keep the strength of the fertilizers close to the root of the plant. Land plaster applied to the young plant of either clover or barley is found to greatly increase its growth, and when grass or clover can be grown successfully, the foundation is laid for improving the fertility of the soil. It takes nothing but what it returns with interest, in the shape of decaying roots and leaves; and when a field gives good grass, it will give anything after that if it is well treated.

I might say I have had some experience in clay soils that have been over-cropped or worn. The farm that I am living on was rented for fifteen years in succession previous to my going on it, and it was at a time when wheat could be grown without as much preparation as at the present time, frequently one crop following another. The price at that time was good, which made the tenant feel like getting the wheat no matter how it was got; hence the cause of over-cropping. And to give you some idea of the state of the soil at that time, I might say that my first threshing did not amount to four dollars. Four dollars was the price for the set, consequently I gave the thresher the four dollars. What made the matter worse was, I did not get any fall plowing done, and the spring was very wet, and what was done then was not well done. Then the summer set in very dry, and locked up the fertility that would have been available. The dairy business has been the secret to the success that has followed, and I have found it the most profitable for this kind of work. Nothing goes out but the butter, and the greater part of what composes that is indirectly drawn from the air. The soil retains and increases its fertility with the manure that is put back on the land, and what the butter is sold for is clear gain.

Cheese-making and stock-raising may come next to increase fertility of the soil; but unless the whey in cheese-making is brought back and fed on the farm, it is not as good as the butter business. Butter is the only product of the farm that does not deplete the soil. There is no other system that will increase run-down land more quickly, cheaply, or profitably than butter-making, for there is a profit from the first—the inexhaustible atmosphere producing the largest portion of the fertility. The clover plant is the main one of the grass plants to assist as food for dairy stock, and is likewise the best plant for enriching the soil.

Scientific men have estimated that an acre of clover roots is equal in value to eight hundred pounds of high grade ammoniated phosphate, and that it contains nitrogen, potash and phosphoric acid to the value of about eighteen dollars, compared with artificial manures purchased with a like sum, and this is mostly procured from the subsoil through the agency of the clover. The sod as well as the plant, plowed under, makes an excellent preparation for almost any crop. It will stand drouth better than any other forage plant except corn; and when cut at the proper time and rightly cured, makes the best hay known for butter cows. The manure from cows kept on clover is of far more value than when timothy is fed. Under ordinary management clover will mostly disappear in two years, hence the necessity of sowing fresh seeds often. A great many successful farmers attribute their gain to the growing of large crops of clover. There is no plant that will assist in restoring worn soils in so many different ways as the clover plant. Clover and grass shade the soil, retain the moisture in dry weather and render it porous, while filling in vegetable matter. Plants vary in power to appropriate food. Clover has a high power to gather nitrogen, while wheat has a low power; therefore clover is an excellent crop to precede wheat or barley. Wheat grows mostly in cool wea-

ther when nitrogen is slow of coming in, or is almost dormant ; hence the soil for wheat must be rich in nitrogen. On the other hand, corn grows wholly in warm weather, therefore needs less nitrogen to make a crop. The comparison might be carried on a little further to show that plants have their favorites in plant food. Take wheat, for instance. A quantity that will take $1\frac{1}{4}$ lb. of potash requires $3\frac{1}{4}$ lb. of phosphoric acid, and potatoes that require $3\frac{1}{4}$ lb. of potash to $1\frac{1}{4}$ lb. of phosphoric acid. This proves conclusively that the farmer should know the nature and quality of his soil, in order to know what kind of seed to sow or plant. The one requires just opposite to what the other does ; so that land that is deficient in potash is not suitable for potatoes.

Reckless farming in time depletes the soil below the point of profitable production ; but that does not say that it is entirely worn out—only that the proper means have not been taken to bring the good qualities that are left to the front for future usefulness. The action of the frost on the soil, when exposed to it, has a tendency to increase its fertility by placing it in a position to become plant food. The stubborn clay soils have become quite mellow through its action of unlocking the fertilizers that it contained.

Frequent plowing and cultivating of the soil in dry weather, and exposing it to the sun and atmosphere will improve its condition, but must not be left for the heavy rains to wash out what was gained, and the sooner it is seeded again the better it will be for the land. Plants take food only in soluble or gaseous forms, and it is a wise arrangement that soil does not dissolve as freely as sugar or salt, or one soaking rain would ruin the land. Grasses are conservers of the soil, and prevent washing and bleaching. In conclusion I might say of the different plans just mentioned for improving the soil, there is none I would prefer to that of growing plenty of clover, with thorough draining ; and give the dairy cows a chance at the clover.

PROFITS IN FARMING.

BY S. G. KITCHEN, ST. GEORGE.

I wish the Committee had given me something easier to talk or write upon than profits in farming—so much depends upon the farm as well as upon the farmer. You know the wide difference even upon different fields of the same farm. The one field of even soil, all of it fertile and no wet or waste places, yields a handsome profit ; whereas the adjoining one, with an acre or two wet and unproductive, is worked at a loss. There is also the lucky farmer, who has a large number of acres of that particular crop when the market for it is booming.

Now, one object of this paper, is to point out in the first place the difference between good and poor land. The farm or field that produces the extra ten bushels per acre is cheaper at $100 per acre than the other as a gift. The ten bushels of barley is worth, say, $5, or the extra ten of wheat worth this year say $6.50, and it is this year's crops and prices we purpose discussing and no other. This extra $5 or $6 represents a fair rental for land worth $100 per acre. So you see it does not require much wit in a financier to cause him to look out when buying or leasing land to get nothing but the best lands to till. And, too, the farmer had better trust to mental vigor than luck or unremitting physical labor.

I never did think it profitable for a farmer to kill himself with hard manual labor. One year after another brings its changes of condition that require the closest study and good judgment. Nowadays the man who makes farming a success is he who gives it his undivided attention and conducts his business in an economical and business-like way.

The possibilities of the farm none of us, to my mind, has or ever will reach, although all could have done better if we had studied our business as we should, or even had given it that attention and study that successful men in other pursuits have given. The merchant or professional man who is away from his business even one day in the week, or even one or two hours of every day, will soon go to the wall. How, then, can farmers leave perhaps $2,000 worth of live stock to hired help and not suffer loss? The farmer who is

not in his stable during the feeding hours of, I might say, seven days of the week, will have his profits turned into losses nine times out of ten. The farmer, even this year, said to be the most unprofitable that any of us has ever seen, should be able to pay his rent, or if owner, be able to place money equivalent to a fair rental to the credit side of his account. It is true wheat in our time has never been sold at 65 cts. per bushel as this year; but properly tilled wheat fields have averaged easily 30 bushels per acre. This means, say, in round numbers, $20 per acre. Now what did it cost you to grow that wheat? All good farmers are agreed that we should not lose the use of land two years for wheat, as formerly, in the old days of summer fallowing. Wheat is sown upon meadow land or after a summer crop, consequently one year's rental is all we can charge to the farm, say $4 per acre; plowing will cost $1.50 per acre; rolling and four cultivatings, $1.25; seed, $1; drilling, 25 cents; harvesting and housing, $1.50; threshing, $1; marketing, 50 cents; total, $11 per acre. Your barley averaged this year 30 bushels per acre at 45 cents per bushel, or $13.50 per acre, costing you to grow $10 per acre. Then upon your 100 acre farm you no doubt grew where these two are the only grain crops, 25 acres of wheat and 25 of barley. Your wheat account then stands thus: 25 acres at $20 per acre, $500; 25 acres at $11 per acre, $275, leaving balance $225 credited to farmer for superintendence. Barley account, 25 acres at $13.50 per acre, $338; cost of production, 25 acres at $10 per acre, $250, leaving $88 profit.

We have now dealt with 50 acres of the 100. Allowing 10 acres of timber and uncultivated land, you have still 40 acres to hear from, which should be used to produce food for stock. Divided into say 10 acres hoed crop, 15 acres hay and 15 for pasture, your 10 acres of hoed crop will cost you $20 per acre, or $200; your 15 acres of hay costs $6 per acre when in the barn, or $90. At a rent of $4 per acre $60 would be the cost of 15 acres of pasture field. The total cost of the 40 acres would therefore be $350. What do we realize from these crops? They will feed 20 cows, and the working horses, which should only be three in number. These cows will bring in a return of $800. Enough roots and corn can be spared, together with the skim-milk, etc., to produce pork worth $200, making a total income from stock of $1,000. This, less cost of production, $350, leaving a balance of profit of $650. To this add profit on wheat, $225, and on barley, $88, and it makes a total profit on all crops of $963. Deduct $125 for interest on investment, and $38 for taxes, fences and insurance of stock and implements, and $700 remains. Or in other words, the farmer receives $700 salary per year for managing 100 acre farm based upon this year's crops and prices. I say, then, if I am correct in the fact that it costs $11 to grow an acre of wheat, and you have 30 bushels per acre, that $10 will produce $13.50 worth of barley, and that 40 acres will keep 20 cows, together with straw from grain crops, and that the income from each is $40 per year, and the pork sold is worth $200, I certainly am right in my deduction that the farmer gets $700 per year for superintendence of 100 acres of land, with the substantial perquisites of garden, orchard and poultry, which go a good way towards the support of his family. Of course the farmer has earned fair wage by manual labor aside from this—a portion of which labor should off-set the labor of milking, the only work I have not already accounted for.

PACKING AND SHIPPING APPLES.

BY JUDSON ROSEBRUGH, ST. GEORGE.

In asking me for this paper I have taken it for granted that you wish me to state what I have seen and heard in England concerning our apple trade, and how we can dispose of our fruit to the best advantage, but as this has been my first lesson I feel more anxious to learn than teach.

In this section of the country the flour barrel only has been used for carrying apples, and if we continue to use it we must pay more attention to its construction. It is the general opinion that anything in the shape of a barrel will do for apples, but this is a great mistake. The hoops will all be loose on a barrel made from green timber when it reaches England, and nothing but well seasoned material should be used. The bulge

hoops should be heavier and better nailed, as I found in taking them apart that they had sprung nearly half an inch; some barrel-makers put a brass wire around each hoop, which is a great improvement. But a smaller package than the barrel is being called for, especially for the Christmas trade. A number of half barrels were used last season with good results. What is wanted is a package that will hold about one bushel or one bushel and one-half and will look to hold all it does; it should also be neatly made as much will depend on appearance. Before the apples are put in the bulge hoops should be driven down solid and well nailed. This should be attended to as many slacks are caused by these hoops coming loose while rolling the barrels.

To have apples appear well when they reach the market they should hang on the trees until they are well colored; some of our winter apples were in England before they should have been taken from the trees the past season. Grade all apples with respect to size, the smaller have a better appearance by themselves than when mixed with the larger ones, the same quality throughout cannot be too strongly urged.

To pack apples for the English market requires the greatest care if we intend to get a paying price for them, but if we will be satisfied to take a low price all we require is to put them up in poor shape. John Bull is willing to pay a good price if we can give him what he wants. The reason we should send nothing but good fruit is because they grow poor stuff there, and it retails there for less than the freight and barrel cost us. I do not think I am estimating too high when I say that if one-quarter of the apples that went to England had been culled out and evaporated or fed to the pigs and the remaining three-quarters put in the best shape possible we would have had more money coming into the country for our apples; and, what is of more value to us, we would have saved our reputation which we have had in the past years for having the best apples that came nto the English market.

As all growers wish to dispose of the poorer class of apples I would like to say a word for the evaporator. One barrel of Baldwins or russets will make at least twenty-one pounds of first class evaporated stock, which are now quoted at 9 to 9½ cents per lb. But supposing we take it at 9 cents, it will bring us $1.89 cents. Then from this we will have 13 lb. of skins and cores that are quoted at 1½ to 2 cents per lb. If we take it at 1½ cents it will bring us 19½ cents, making a total of $2.08½ cents per barrel.

It is estimated by some large growers that they can take the apples from the orchard, evaporate them, put them in the fifty pound boxes cheaper than they can take them from the trees and barrel them. It would certainly be a good thing for this section if more of the poorer class of our apples could be evaporated, or made into jelly or jam. A great many of our apples were scabby and spotted this year, and if I was ever surprised it was when I saw some of these apples opened in Liverpool. It was those with the black spot under the skin that have done the most damage. These were covered with mildew over the spot and when that was brushed off I found the full size of the spot decayed.

All apples for shipping should be carefully hand picked, and unless there is a good sod with plenty of grass they should be piled on straw. Then the fish-worms cannot take dirt up through the pile. Never cover the piles with straw; corn-stalks bound in sheaves are much better. But a yet much better plan is to put them inside out of the rain. This can be done very easily by putting them in the barrels as they come from the trees and hauling them in each evening. Then they can be selected and packed in bad weather. An experienced dealer told me that he could tell immediately on opening a barrel of apples if it had been put inside before being packed or not. After seeing a few barrels opened that had been packed while they were wet, I will never put them up wet again if I can avoid it, as they look very mussy and dirty when opened. Most dealers prefer to have two rows faced inside of one. If this is done no bad colored apples will show when the barrel is opened. Do not pick out the very largest for facing, but a good average and nice clean fruit. The same quality throughout cannot be too strongly urged.

I noticed in the auction market in Liverpool as soon as Boston apples were put up the shout would go round the room, "Dump them out," as they were afraid of trickery. I had the pleasure of hearing Prof. Robertson address a meeting of the Liverpool Provision Trade Association, and he told them the Canadians had the knack of putting small apples on top of the barrel, but there have been a few exceptions the past season. Shake the

barrel after each basket and finish up with stems up and round up a little toward the centre. All barrels should be branded with a special mark for the quality of fruit it contains, and full instructions given to the seller to get the best results. When I contracted with the steamship company for the carrying of my apples I was to have careful handling and cool storage, but when I reached Montreal they were taking them from the drays and letting them run down an incline about twenty feet, when they struck the bottom some of them would bounce nearly four feet high. I told them they were damaging the fruit but they would not listen to me, I then went to the manager and he came and made them let the barrels slide down lengthwise. They could do it nearly as fast and not hurt the apples in the least. After we got started from Montreal the captain had canvas put over the ventilators and when they were not taken off for a day or two I asked him his reason for covering them up. He told me it was to keep the wet and cold from the apples. I assured him that the wet and cold would do no damage, and at my request he removed the canvas and set the fans running which brought the temperature down several degrees in twenty-four hours.

When our apples reach Liverpool it has generally been the custom to put them up to sell by auction. This is all right when there is a good demand and plenty of buyers, but when the market is glutted as it was the past season they are sacrificed at a great loss to the shipper, while in the towns and villages not fifty miles away there is a good demand for that very fruit.

Some of our shippers must have lost immense sums of money the past season. I saw very fair apples from this part sold on the auction at from 7 to 11 shillings per barrel, and some inferior from 4 to 7 shillings. The Imperial Produce Company of Toronto are on the right track. They have their agents in Liverpool to look after the fruit when it arrives, and the Liverpool agents have agencies established at different points, and when the apples arrive they can send to each man what he requires and receive much better prices for them, as to a certain extent they avoid the gluts.

One day while looking around Covent Garden market I could not help but notice the great difference in price ; some very fair apples were selling at nine shillings, while those that had been carefully selected and packed were selling at thirty shillings for choice varieties. I am sorry to have to come home and report that we have sent thousands of barrels there last year that never should have seen that market. If we wish to gain their trade we must put our fruit up in the most attractive form possible. Prof. Robertson has the thing in a nutshell when speaking of our trade with England when he said it was like the girls, a little coy and needed a little coaxing always ; and if I were to add anything to that saying it would only be that there are a good many boys after the girls and if we wish to win their trade we will have to keep our eyes open. Apples are coming into England from every quarter. There is scarcely a nation on the face of the earth that has apples to export but what is courting the trade of that country. Australia is doing a large trade, and Cape Colony is working up a trade there, besides the large shipments that come from the continent of Europe.

In conclusion, I will say that it should be the wish of every Canadian that when another year comes around we will have a different record to show, and that in the future any barrel of apples that is branded Canadian will bring the highest price of any apples that go into the English market. Then we will be able to sell to men who, if we give them the fruit as they want it ; will not question the price.

HINTS ON BREEDING, AND HYGIENE OF PREGNANT ANIMALS.

BY S. E. BOULTER, V.S., NORWICH.

A volume of itself would be required to do justice to a subject possessing so many features of interest and importance as the effects of breeding on our different classes of animals. Our observations on it, therefore, will necessarily be brief and of a general nature. That breeding has a considerable influence on the value of our different classes of animals will be readily admitted ; and the great attention which has been given to this subject by breeders during the last twenty years has been rewarded with the most suc-

cessful results. Frequently we hear it said that there is a deterioration of the horse of to day as compared with those of past generations. Such, we are happy to state, is not the case. We fully believe that never in the history of Canada, or even the world, did we possess such a number of valuable animals of every class as at the present time.

The general axiom laid down is that "like will produce like," and that the progeny will inherit the general or mingled qualities of the parents. This fact should not only be taken into consideration with regard to the general conformation, temper, etc., of the animal, but also in regard to the transmission of disease. That disease is transmissible from the parents to the offspring there cannot be a doubt; and such is the hereditary nature of certain diseases, that, although they may not show themselves in the immediate progeny, they frequently do so in the next or even more distant generations. Hence the necessity of a thorough knowledge of both sire and dam. One of the first principles we would therefore impress upon the breeders of all animals, and the horse in particular, is that both parents should be free from disease. There is abundant proof that blindness, roaring, side-bones, ring-bones, spavins, navicular disease, and a number of others, have been bequeathed to the offspring of both sire and dam. Nor is this all, for although the freedom from disease of some particular organ on the part of one of the parents may counteract, and to a certain extent obliterate a palpable defect in that organ in the other, there will still remain a peculiar weakness, or tendency in the part, which requires but some slight exciting cause to bring about its full development. There cannot be a doubt that the employment of such animals for breeding purposes is calculated to produce the greatest evil amongst all classes of animals, and the best course that can be adopted, is to consign the sires to an operation, and use such dams for work on the farm, and thus prevent the spread of their deleterious influence. Peculiarity of form and constitution will also be inherited. This is a most important but often neglected consideration; for however desirable or even perfect may have been the conformation of the sire, every good point may be neutralized, or lost by the defective structure of the dam. The essential points should be good in both parents, or some minor defect in either be met and got rid of by some excellency in that particular point in the other. The unskilful or careless breeder too often so badly pairs the animals that the good points of each are almost lost, the defects of both increased, and the progeny far inferior to either sire or dam. It may perhaps be justly affirmed that there is more difficulty in selecting a good dam to breed from than a good sire, because she should possess somewhat opposite qualities. Her carcase should be long, in order to give room for the growth of the fœtus, and yet with this there should be compactness of form and shortness of legs. What can they expect whose practise it is to use worn-out, spavined, foundered, and blemished mares, about which they fancy there has been some good points, with all their variety of shapes to breed from. This is a lottery, and in a lottery like this there may be now and then a prize, but there must be many blanks.

As to the shape of the sire little that is satisfactory can be said. It must depend on that of the dam, and the kind of animal wished to be bred. But if there is one point absolutely essential, it is "compactness"—as much goodness and strength as possible condensed into a little space.

The system of crossing requires more judgment and experience than breeders usually possess. The bad qualities of the cross are too often engrafted on progeny, and, once engrafted there, are not, for many generations, eradicated. The good qualities of both are occasionally neutralized to a most mortifying degree. On the other hand it is the fact, however some may deny it, that strict confinement to one breed, however valuable or perfect, produces gradual deterioration. Crossing should be attempted, but with great caution. The valuable points of the old breed should be retained, but varied or improved by the introduction of some new and valuable quality, in the new, with reference to beauty, strength, or speed. A great deal more might be said on this subject of breeding, but as the subject of hygiene is also very important, I will give to this Institute a few hints on that subject.

The hygienic measures to be observed in the management of animals during gestation are, in general, those which should prevail always, irrespective of this condition. But besides these general principles, there are a few particular precautions to be attended too, in order that this period may be safely and successfully passed through, and these precautions are all the more necessary as the period of birth approaches.

Unlike the human female, pregnant animals do not require those careful, numerous, and minute attentions so essential to their health and the welfare of their offspring; indeed, too much nursing and pampering by removing animals further from their natural condition is unnecessary and likely to do more harm than good.

With those animals which are employed in labor, as the mare, it is well not to work them severely, nor fatigue them much, and particularly as pregnancy is advanced; and, on the other hand, absolute repose is pernicious. Exercise is most beneficial, for the most difficult cases of parturition generally occur among those animals to which this is denied.

The pregnant mare will accomplish ordinary and accustomed work, particularly if it be slow, without any harm, and perhaps with benefit, until the eighth or ninth month, when more care must be observed; but moderate exercise should always be allowed up to the period of parturition. Harness is preferable to saddle work for pregnant mares; and fast trotting, galloping, jumping, travelling over broken ground, or severe and sudden exertions, injuries, or shocks of any kind, are to be avoided, in fact, extremes should be guarded against. If the animal must be employed for riding, the spurs should not be used, because of the sudden contraction of the abdominal muscles which their application induces, may lead to abortion. Should the animal not be employed at moderate work, then it ought to be regularly exercised, or turned into a yard provided with shelter from inclement weather.

The food of pregnant animals is an important consideration. Animals in this condition should be well fed. The appetite is generally increased, and there is a tendency to fatten. This tendency should be guarded against, as it may prove troublesome, particularly if it is allowed to proceed to an extreme degree, when it may retard the development of the fœtus, induce abortion, cause difficult parturition, or give rise to serious after consequences. This precaution is more to be observed in the second than the first half of pregnancy, when the food should be plentiful, but not in excess, and flesh more abundant than fat. The food should be of good quality, very nutritive, easy of digestion and not likely to induce constipation. Indigestion should be carefully guarded against and unaccustomed, hard, damp, bulky, mouldy, fermentable, or otherwise hurtful, altered food should be avoided, as it is likely to pro luce injurious results. Grazing on level pasture lands is favorable to pregnant animals as they take their own exercise and breathe a purer atmosphere than that of stables or sheds. But it must be remembered that they should be protected from damp, fogs, cold rain and stormy weather. If the herbage is not sufficiently abundant and nutritive, it should be supplemented by an additional allowance of food. The water should be pure and plentiful at all times, as then the animal will drink only moderate quantities and when necessary.

A point to be particularly attended to is not to allow pregnant animals to drink very cold water, nor eat food at a low temperature. I have seen that the fœtus is extremely susceptible to the action of cold, and abortion is by no means unusual through the operation of this susceptibility. Frozen food, such as roots or grass covered with white frost, should therefore be withheld from pregnant animals, as they are likely to induce abortion, metritis and other serious accidents, either through their direct action upon the fœtus or indirectly through the derangement they set up in the digestive apparatus. With regard to dwellings, the hygienic rules which should always be observed in buildings in which animals are kept ought to be rigorously enforced with regard to those in which pregnant animals are lodged. Cleanliness is, above all things, necessary to be observed. All pregnant animals within a week or two of parturition should be kept apart in a clean, well ventilated, loose box-stall, with plenty of litter, which should be well shaken daily, and any decomposing portions removed and replaced by fresh; no heap of fermenting fœces should be allowed to remain during the day in the corner or in any part of the stall.

Stables, sheds and loose boxes should have wide doors to prevent injury to the dams while passing through.

With stalls, the floor should be as level as possible, for if the inclination from before to behind be at all marked, the weight of the gravid uterus is thrown backwards and this may lead to abortion, prolapsus of the vagina, and even eversion of the uterus. Should a case of abortion occur in a stable, among pregnant animals, the one which has aborted ought to be removed at once and the place it occupied thoroughly cleansed and disinfected, every trace of the accident being most scrupulously obliterated. Animals that indicate approaching abortion should be removed from the vicinity of other pregnant animals and kept apart from them so long as there is any vaginal discharge, the same precautions which must be adopted with regard to thorough disinfection and cleansing, are likewise necessary here.

It is not advisable to have animals bring forth among others whose period of gestation has not arrived. As I have already remarked the animal a few days previous to the act of parturition should have a roomy loose box well supplied with soft litter, and when the act of parturition commences, it is rare indeed that anything requires to be done during, at least, the two first stages—those of preparation and dilatation of the *os uteri*. Therefore the animal should be allowed perfect quietude, and if the light in the stable is too strong, it may be partially excluded. A trustworthy person may remain with it in order to avert accidents, but he should keep himself out of sight and meddle with the animal as little as possible; unless something irregular or abnormal occurs during the act all should be left to nature. Sometimes there is as much wisdom shown in remaining a spectator as in interfering at other times when circumstances require it. Should anything abnormal occur, no unqualified person should venture to attempt delivering the animal himself, or to pull about the mother or fœtus, as this may only tend to aggravate the accident and render relief more difficult. The veterinary surgeon should be sent for, as his knowledge and practised manipulative skill will, in the majority of cases, bring the most complicated labor to a prompt and happy termination, preserving the mother and often the produce. This appeal to the veterinarian is not always made, however, until the owner, his servants and neighbors, or the empiric, have done great damage and caused the loss of valuable time. Then he is sent for, but now the case may be one of extreme difficulty or hopelessness from exhaustion or injury.

SMALL FRUITS.

BY J. R. HOWELL, MT. PLEASANT.

So much has been written, year after year, upon the subject that it seems almost folly for me to try to add anything of interest or of value. I shall, therefore, make my paper very brief, thus giving more time for some of the other questions we find on the programme, for really the great question of the day is not as to how we can grow more fruit, but how we can better handle, pack, transport and distribute what fruit we already have the knowledge to grow.

Enrich the Land. One of the first and most important things that the small fruit grower must learn is the value of fertilizers. For the best results in small fruit our average land must be well fertilized. This is especially necessary where strawberries are to be planted.

Thorough Cultivation. If I were asked what is the one great thing requisite for success in the cultivation of small fruits I would say thorough cultivation. If fruit-growers, and farmers especially, would tend less acres and cultivate much better, the returns would be vastly increased in dollars and cents, and happiness as well.

Do Work at the Right Time. That there is a time for all things is but true One man may expend as much labor as another on like crops with very different results, the one doing things when they need to be done, the other when he gets round to the

work. Many things in the fruit business must be done at the proper time or not at all. Often one day's work at just the right time is worth more than ten days' at a later date. For this reason a fruit-grower should not try to get along without hiring extra help, at certain seasons at least. If the work needs doing, and you cannot do it yourself, hire it done, and the investment in labor may pay you 100 per cent. or more.

Strawberries. Plant early in the spring in fall prepared ground. Start the cultivator as soon as the ground is dry enough and keep it running all the growing season. The dryer it gets the better. Cover in the winter as soon as the ground is frozen, using about two loads of straw per acre. Rake mulch between the rows in the spring.

Raspberries. Plant either early or late in the spring; that is, before the top starts or after it is one foot high or more. Cultivate thoroughly, the first season especially. The next spring clip canes two and one half feet high, later, the branches to within one foot of the canes or less. Cultivate or mulch thoroughly. In the late fall or early spring remove all old canes. A top dressing of manure each year will pay.

Currants and Gooseberries If you have it, plant on a deep, rich loam. Prune each year, leaving only one-half dozen main branches or stems. This will insure much finer fruit, though not so much in quantity.

Blackberries.—Use roots or one year sprouts or canes for planting. Cultivate well all the growing season. In the spring cut canes to a height of three feet. After the first year or two keep canes thinned out somewhat.

Grapes. The grape is the fruit for the people It is enjoyed by all and injures none. In village lots, where there seems to be no room at all, one can raise grapes if he only has a fence or building to train the vines on. While there are things about it that the skilful vineyardist hardly understands, the fact remains that when a man plants a few vines, he and his family have grapes, while those who hesitate on account of possible failure deprive their families of this fruit.

Packages. Use a neat, clean, dry, full size package for your fruit. The package is a very important thing, and should always receive careful attention. We might have made suggestions on what to mark the ground with, methods of planting, the kind of tools to use, varieties of plant, etc., but that would make this paper too long, and thus intrude upon your valuable time for discussion.

THE PREPARATION AND APPLICATION OF FARM-YARD MANURE.

BY A. MCNAIRN SOULE, NIAGARA FALLS SOUTH.

When our forefathers first commenced the cultivation of the virgin soil they were astonished at the apparently inexhaustible store of plant food it contained. Consequently they cropped it without mercy. Apparently they did not realize that the most fertile, soil must sooner or later become exhausted if this practice was continued without supplying some form of fertilizer to take the place of the plant food removed by the various crops. Such was the case, however, and farmers in many localities at the present time find themselves confronted by this serious obstacle to progress and prosperity. Manifestly there is no more important question requiring solution than how to profitably and effectually restore and keep our soil up to a high standard of fertility without incurring too much expense.

Realizing that this is a true representation of the present state of affairs, does it not seem reasonable that we should husband to the utmost those resources under our direct control? Does it not seem lamentable that so many agriculturists neglect to study the best methods of preserving and applying the best general fertilizer known, viz.: farm-yard manure? And even more lamentable that they allow thousands of dollars' worth of the best part, viz.: the liquid portion, to leach away each year? It is not for us to grumble about hard times until some of these serious defects in our present practices are remedied.

First, then, let us consider for a short time some of the principal factors that influence the value of manure. Farm-yard manure as made on the average farm consists generally of the mixed excrements of the horse, the cattle beast, sheep and swine, together with the litter used for bedding. Chemical analysis has demonstrated that nitrogen, phosphoric acid and potash are the three most essential elements of plant food, and if these three are present in sufficient quantity the soil usually contains a plentiful supply of the other minor constituents required by the plant. Many artificial fertilizers can be obtained that contain one of the above-named elements, but as yet no one has been discovered containing all three in the most suitable proportion. Again, the extra expense of buying and handling artificial fertilizers is very great. Their composition is very uncertain and their action so readily influenced by the season, climate and condition of the soil, that there is great risk incurred in their purchase and use. Evidently, then, it would not pay the average farmer to deal in them very largely unless for some special purposes, as in the case of fruit growing.

There is a manure, however, that combines the three elements, nitrogen, phosphoric acid and potash in very suitable proportions, and it is to be regretted that it is not found in larger quantities on every farm, viz.: farm-yard manure. Thus you perceive the best, surest and cheapest material to carry on the work of restoration is under our direct control.

Of the four excrements under consideration, according to many careful and elaborate analyses, that of the sheep is the richest, especially in nitrogen and phosphoric acid. The manure of the horse comes next, being rich in the same constituents, but owing to its hot nature it ferments and volatilizes very rapidly, and unless care is exercised much of its value may be lost. Swine and cattle excrements follow in the order named. These latter are of a much colder nature and accordingly do not ferment rapidly. It is quite evident, then, that the best way to preserve these manures is to mix them together as they are made, thus retarding rapid fermentation and the consequent losses it involves. Now from this it appears that the value of the manure will depend to a considerable extent on the proportion of the various excrements it contains. For example, that obtained from sheep and horses being richer in nitrogen and phosporic acid and fermenting so rapidly, would be much better adapted for hot beds than if it contained all four mentioned. But in considering this point we must not forget that the excrement of cattle is produced in so much larger quantities that it really overbalances the superior richness of sheep and swine dung for general use.

The next thing that affects the value of the manure is the kind and quantity of the litter used. Many analyses have been made of the various kinds of straw, and it is generally recognised at present that pea-straw is the most valuable as it contains the highest percentage of potash, which is one of the essential elements of plant food. Oat, wheat and rye follow in the order named. There are many others as leaves, sawdust, etc., but straw is the one in general use. Barley straw is objectionable from the fact that the beards adhere to the coat of the animal and spoil its appearance. No definite rule can be laid down as to the amount of litter required but sufficient to absorb all the liquid thoroughly and keep the animal dry, clean and warm, should be supplied. The shorter and finer form it is in the better for the purpose intended.

The absorbent power of the litter must also be considered. Of the four in common use pea-straw stands first, followed by rye, oat and wheat in the order named. Many others might be mentioned, as peat, muck, moss, sawdust and leaves, but as these can only be obtained in certain localities they are not of very great importance to the average farmer.

Again, the age, breed, sex and condition of the animals producing the manure are all modifiers of its value. For instance, the young and growing animal requires a larger amount of nitrogen, phosphoric acid, potash and calcium to build up flesh cartilage and bone respectively, and accordingly the excrement from such an animal must contain just that much less of the elements mentioned. On the other hand the excrement from a fully matured animal must be so much richer on account of its having attained its growth, and consequently not requiring so much of those elements to build and keep up the system. Similarly it it easy to understand how some breeds are harder to feed than

others and require more of the elements mentioned to sustain them. Then, too, it is plain that a poor animal when first put in the stall will extract more of these elements than one already in good condition. The same applies to milch cows. As milk contains nitrogen, phosphoric acid and potash, the cow must extract these elements from the food and thus leave the excrement poorer in plant food.

The nature of the food will also exert a great influence on the value of the manure. For it is reasonable to suppose that if a poor ration is fed the excrement will be correspondingly poorer, and *vice versa* if a rich ration is consumed. Many interesting and instructive experiments have been conducted along these lines, and the analyses have invariably shown that the richer or poorer the ration, so the manure will be proportionately richer or poorer in the elements combined in the food fed.

We have now come to the consideration of the best means of preserving manure. Very much has been written on this subject, but as yet no very satisfactory or unanimous result has been arrived at. There are, nevertheless, a few rules that may be laid down for our guidance that will at least help us to some extent.

Very many barn-yards are so exposed to the sun and rain that they aid the one in inducing the destructive fermentative processes and the other in washing out the more valuable parts in the form of liquid. Again, many barn-yards are situated so that they form a natural drain from the manure heap. This can generally be remedied without much expense or difficulty. Always have the barn-yard as little exposed as possible; have it on a perfectly level piece of ground and have it concave and well hollowed out so as to form a natural drain from the sides to the centre and this will form a reservoir and thus effectually prevent loss from washing. It is estimated by chemists that the farmers of this province annually allow from one-third to one half of the most soluble and certainly from this fact the most valuable part of their manure to leach away through neglect of these principles. We also know that air or rather the oxygen it contains is one of the chief causes of loss in the manure pile. Therefore we should always keep the manure well tramped and compact to prevent its gaining access. It is not desirable to ferment manure in the barnyard very much if any, owing to to the serious losses it is likely to incur. That can be done with safety and without danger of loss in the ground.

Another aid to prevent this loss from the action of the air is the use of gypsum or loam. The gypsum prevents the escape of the nitrogen in the form of ammonia and is not expensive. It may be urged that it is impossible to handle such long strawy manure if it is not composted or rotted before applied. Well, the way recommended by our leading men is to cut the straw and this will not only avoid the difficulty but will increase the value of the manure, ease of handling and the absorbent power of the straw.

The Germans have made greater progress in the study of this subject than any other people. The German farmer is called the "economist," and the practice in vogue there is to to keep cattle of one age together in box stalls or sheds so that they may no injure one another. And, by the way, the practice of dehorning now beginning to be practiced so generally, will enable the work to be carried on better than ever before. The manure is not removed until two and a half feet deep, and if sufficient litter is applied there is very little danger of any injurious effects to the hoof from the microbes that are known to infest manure and which are thought by some to be the causes of various diseases of the foot. It is then drawn out and piled in the fields in snug piles, an alternate layer of manure and loam, and when allowed to lay long the whole is seeded with clover or rape. This manure is generally drawn out in February. The manure in these piles is tramped solid, for if left loose much loss would occur from fermentation, and tramping it perfectly solid prevents this.

It has been recommended to have tanks in the yard and as the liquid collects, pump it up and scatter it all over the heap with the aid of the hose. This is a very effective way of preventing volatilization and keeping the heap moist; but when we consider the cost it would be quite beyond the reach of the average farmer.

The most satisfactory way of preserving manure would be to keep it in an open shed at one end of the stables. This would be convenient, and if pigs were kept in the place they would keep it tramped down and exclude the air. This method would also protect it

from the action of the sun and rain, but the question again arises as to whether it would pay the ordinary farmer to erect a shed simply for this purpose. However, if such a shed could be utilized for stock to run in for exercise, or even for shelter as in the case of sheep, then it would pay to have one.

Of course the form of applying the manure will be modified by the purpose for which it is intended. It is quite evident that the degree of fermentation at the time of applying it must be influenced by the nature of the crop. If it is applied to a crop that has only a short period of growth it must be well fermented or the crop will not derive sufficient benefit from it, and so if the crop has a longer period of growth it will derive the same benefit from manure in a much coarser condition. Manure should always be applied in coarse form to heavy soils as it has a tendency to augment the humus and increase the fertility, but it would be dangerous to follow this practice on light soils as the tendency would be to produce an undesirable degree of lightness. Again, to obtain the best results on a light soil when the period of growth is short, it would be the part of wisdom to apply the manure in a well fermented condition.

Manure should always be applied near the surface and more especially on light soils. All soils leach more or less, and thus, we see, are inclined to wash the valuable constituents down into the sub-soil beyond the reach of the crop. Nearly all our crops are shallow feeders comparatively speaking, and thus if the manure is plowed in deeply, the roots fail to reach it and consequently lose the benefit of a great portion of it.

The two most satisfactory ways of applying manure at present are as follows:

1. To draw the manure out to the fields in winter and pile it in heaps in convenient places and then draw it and spread it as early as possible in the spring and plow it under as fast as it is drawn and spread.

2. To draw it directly from the stables and spread it directly on the field as it is made. There is a slight waste in the spring, but of a very light nature. These methods give good satisfaction and enable the farmer to do a disagreeable and hard task at a time when its unpleasant effects are not so noticeable, and also to save much valuable time when the rush of work comes on in the spring.

THE DOG TAX.

BY R. E. KING, DECEWSVILLE.

There is a certain knowledge amongst the owners of sheep that at present these animals do not receive sufficient protection. But since the dog has many warm friends, experience has shown that it is very difficult to get increased protection. Hence it follows that the shepherd should endeavor to devise some plan which will give him his rights, whilst not at the same time infringing on the rights of the dog owner. With these principles in view I submit the following:

We may class the tax under three heads:

1. Cost of support to the owners thereof.
2. Loss caused to property by reason of dogs being allowed liberty to run at large.
3. Amount collected by the township to defray damages caused by dogs to sheep owners.

As to the first, that is regulated by each individual for himself.

But we wish more particularly to notice the second tax. I make the statement that no dog should be allowed his freedom unless the owner is required by law to make good all damages which may be caused by said dog. And why? (1) Because experience has shown that dogs have been, and are, a menace to the shepherd; (2) that the rights of the shepherd and dog owner are not equal. It will not require a great deal of thought to show that the first statement is correct. One township paid over $750 last year for damages to sheep. My second statement is that the rights of the shepherd and dog owner are not equal as long as dogs are allowed their liberty, for the reason that the shepherd has no guarantee that his flock is safe except by constant watchfulness. To illustrate: Suppose one man has a field of grain and his neighbor a flock of sheep. Then by constructing a legal fence between the two farms the grain is safe, while the sheep are allowed their

liberty. But suppose the man who owns the grain has a dog, what protection is the fence to the shepherd? Then, while we admit the right to own a dog, we cannot admit the right to let him have his freedom, unless the owner is held liable, equally with all other dog owners, for all damages done. And for this reason: That, although my sheep might get into your grain during the night, still they will be there next morning and damages recovered. But if your dog should make a raid during the night, then, although there may be torn and mangled sheep there, the dog, "Oh! where is he?" Then I think it will be admitted that the only just way is to tax all dogs alike.

We will now consider the third tax, viz.: The amount collected by the townships. At present you pay $1 into the township treasury, and this constitutes a fund whereby the shepherd is reimbursed for his loss to two-thirds the value. If anything is left after meeting all demands it is used for township purposes, and if there is not enough collected to meet the demands made then a sufficient amount is appropriated from the township funds to make good the deficiency. A little consideration will show that this system is not satisfactory either to the owners of dogs, the shepherd, or those who have neither sheep nor dog.

I find that in some instances more tax is collected than is required to meet the demands. Then why should the man that owns a dog pay more towards the repair and maintenance of bridges, for instance, than the owner of a team? Then when, as frequently happens, the tax collected is not sufficient to meet the requirements, why should the person who does not own a dog pay for damages which dogs do? Moreover, why should the shepherd receive but two-thirds the value of sheep injured or destroyed if dogs are allowed to run at large, since it is a fact that unless his sheep are continually confined the shepherd is at his mercy? The least that should be expected is that the dog owner pay in full for damages committed in return for the privilege of not being compelled to keep the animal confined.

Now, what we propose is:

1. That an amount equal to the full value of sheep destroyed should be paid to the owners thereof.
2. That the demands should be met from the county treasury.
3. That the amount so expended be levied equally upon all dogs in the county.
4. That each dog assessed be required to wear a license tag.

Let us look at some of the results which might be expected from the adoption of such a policy as the above. By making the county instead of each township responsible for damages, the incorporated villages would come in for a share of the burden.

At present in the neighborhood of 250 dogs are assessed in the incorporated villages of the county of Haldimand, and this does not represent over one-half the actual number, and, as there are no sheep within their limits, this represents $250 clear revenue. But is it not reasonable to suppose that, by reason of the proximity of sheep in the surrounding township, these dogs destroy sheep, and consequently the township is assessed for the damages. And by levying the damages equally the dog owners will then pay only for damages actually committed, and why should they pay more or less?

Believing that the above is just and equitable, I ask your earnest consideration and opinion as to its practicability.

WATER RUNNING AWAY UNUTILIZED.

BY PROF. THOMAS SHAW, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

Power is usually associated with motion, whether it be motion of the air, the earth, or the waters upon the earth's surface, or indeed motion of any of the elemental forces. The degree of the power is usually proportioned to the intensity of the motion. When the wind sleeps a child may play with its paper boat on the margin of the sea; but when roused like some wild beast in its lair, the rock-girt shores can scarcely keep the agitated waters within their proper bounds. The power of motion in the earth is well illustrated in a land slide. The little anemone can revel in its gentle beauties undisturbed at the base of a lofty hill, but when once the demon of the earth is roused, the moving mass tosses about the mighty trees that grow upon its bosom like it would so many playthings,

and turns aside the current of a river-bed, or compels the iron horse to leave his well-beaten race-course for another. So is it with that imponderable agent electricity. When lying dormant it cannot move a feather, but when quickened with all the intensities of motion of which its energies are capable, it splinters the rocks into fragments and turns the skies momentarily into flame.

We have another illustration of the power of elements in motion in the movement of liquids, whether in the natural or the congealed state. When the motion of the waters of a river is sufficiently intensified, and the same may be said of the waters of the sea, the commerce of the nations must pay respectful homage by cessation either temporary or prolonged. In the congealed state liquids in their movements grind the rocks into powder, and stay the march of victorious armies bent upon the conquest of the nations.

But there is a force inherent in the human mind, mightier than the elemental forces to which I have referred, insomuch as it can govern the powers that inhere in the elements, and make them subservient to man's purposes. Mind is mightier in the abstract than matter, for it was mind that gave matter an existence, and mind is mightier in the comminution of its sub-division, for the human mind, which is but a fragmentary emanation from the great Original, can direct the powers of the winds and waters, and render them subservient to its purposes—it can even tame the subtle powers of the furious elements that shatter the rocks into fragments, and so control them that they become obdient to man's requirements. But it is the powers of the human mind in motion that lead to results of such great utility, for the powers of the minds of men lying dormant are of no more use than though they had never been called into existence at all. The capabilities of mind which in action can have autocratic rule amongst the elemental forces are quite unheeded by them when inert. Such, then, being the great powers that inhere in the elements, and such the greater ones that inhere in the human mind, it is a matter of inexpressible regret that those powers should be allowed to run riot, doing no one any more good than the flowers of the wilderness that are never gazed upon by the ken of human being. The contemplative mind can seldom gaze upon the waters of a rivulet even, rushing on in their playful gambols, wasting their energies that might so easily be turned to some useful account and yet they are not, without feeling at least a tinge of momentary sadness ; but far more regretful is the manifestation of human mind in motion to no purposes, for it should not be forgotton that motion simply is not sufficient to produce beneficent results either in mind or matter, but motion that is wisely directed. The motion accompanying the outgoing of human energies is often more aimless than that of waters running away, and its results are fraught with less of accomplishment.

Nature has been wonderfully lavish in her bestowments of latent or reserve power in the minds of the young men of the farm. They enter the arena of development under more favorable conditions than the young of our towns and cities, or even than the youth of our country villages. They usually have more of strength of constitution so favorable to the robust development of powers of mind, their attention is less diverted by the undue stimulations of the never-ending excitements which are the bane of the city boy. Hence when youthful mind from the country comes in contact with youthful mind from the city, the latter is often sent to the wall, and so uniformly are these indications manifested, that in order to sustain the intellectual standard of the city it must needs be constantly recruited from the country. But while this exodus of mind from the country to the city is largely a loss to the country, it is not a loss to the state. This can only take place when the inherent powers of mind lie dormant altogether, or waste their energies to no purpose.

Herein consists one of the greatest mistakes of country life. The residue of mind power that remains is largely dormant or aimless, and hence the comparative slowness of the advance that the farmer makes in the material, intellectual or social advancement. The waters of Niagara collected in an inland sea hemmed in by lofty mountains could only float upon their bosom crafts smaller or larger for purposes of pleasure or of profit, but rolling and tumbling in the river bed, they are capable of generating sufficient power to drive a number of spindles equal to those employed in making garments for the entire human family. So the latent powers of rural mind if energized are capable of achieving in the aggregate, an amount equal to what is now accomplished by the sum total of human effort, and even a great deal more than this. But as the waters of Niagara

unutilized are incapable of driving a single spindle, so the powers of the human mind running riot are incapable of producing one atom of good.

The possession of reserve power is of no benefit if it be not drawn upon. As the force of the current of a river will dissipate its strength in its onward movement without turning one millstone of the miller, and without causing one cylinder of the manufacturer to revolve, unless this power is drawn upon, so the possession of latent power in the human mind that is not utilized will not avail in any degree to advance the interests of the farmer or of any one else. The man who arrests this waste of energies in the running stream and turns it to good account is so far a benefactor of the race. Every item of labor which is made to do is so much less demanded of muscle performance, and therefore so much less demanded of the wearied energies of man. It is also usually found that every item of dormant energy aroused in the human intellect and wisely directed, also tends to the adoption of methods that are muscle-saving in their nature.

The sound of running water is very delightful to the poetic ear, but it is less so to the ear of the utilitarian than the hum of the spindle which it is made to turn.

No good can come to any one from that continued slumber of dormant human energies which ends in the unawakened; no poetry can trace its birth to such a source. And no advantage to mankind in any possible way can burrow its roots in a soil whose inorganic unassimilated properties are incapable of sustaining anything in the shape of life in any of its phases.

Let me particularize on this waste of opportunity by the Canadian farmer. He lives in an age when newspaper literature abounds, and much of it bears directly upon his own calling, and yet in Canada not one rural home in ten is supplied with a purely agricultural paper. Some of these are admirably conducted and contain a succession of information that is of great use to the farmer, but the perennial rivulet rolls onward without the utilization of its waters in homes which it rushes past, but which it may not enter. Many of these periodicals are of marvellous cheapness compared with their worth, but of what avail would even a costly bestowment be to one ignorant of its value, and who was rather determined in the density of his prejudices not to be informed? The hope is not very bright that the class to whom we refer will ever in their day be persuaded to read, but in this age of intellectual fricitions both of the sliding and the rolling character, there is a hope for their boys. It is very probable that the fathers will still be content to prefer the region of the shadow of intellectual darkness, but if the children can only be brought into the realm of light they will then be eager to arrest and utilize the waters that have during all the former days flowed past their father's boundary line unheeded. The agricultural text-book that has come into our common schools should be a great propelling power in the direction indicated.

The farmer's institutes that are being held in the province, from its center to its circumference, are beneficent in their results to those who utilize their power for good, as the waters of the mountain torrent to the manufacturer who plants his machinery on its banks, for the benefits of best experience in the various departments of farm life that are there showered around with a prodigality of profusion are of lasting and constant benefit to the farmer who is sufficiently interested to secure them. It is painful to behold the farmer in unnumbered instances trying plans and experiments in reference to what has been conclusively determined long ago, but of which he is entirely ignorant, because he will not even drink of the stream of information that has been running past him all his days.

Agricultural exhibitions are at one and the same time the pioneers and attendants of agricultural development. Like the waters of a cataract they rush through the land every autumn furnishing ample motive power in the direction of higher attainment in every department of farm life. While it is true that perhaps a majority do come to this exhibition of reserve power, very many do not try to draw upon it as they might or as they should. The object lessons that oftener arrest the attention of our young men at the exhibitions of to-day, are those of an intensity of muscular energies in action, rather than those of proper muscular development in animal life, and of perfected and complete development in the vegetable domain. In other words the tight-rope dancer and the tenth rate clown have greater attraction for many of the young men of to-day, than specimens of live stock and vegetable growth that would have seemed marvellous to the men of a

former age. Our young men who are to secure front rank in the march of progress, must here also utilize the waters of this cataract before they rush past and are gone.

Then there is the swift current of agricultural literature that is rushing past us every day, bearing on its bosom elements of the most beneficent influences to those who care to secure them. Their utility seems unknown to the many, and is duly prized but by the few. Our country spends large sums in providing fire arms and uniforms for our militia, which in all probably will not be required in any battle-field, but is not so with those weapons of progress and uniforms of superior attainment that are borne upon the barges that shoot swiftly down the current of this river. The men who use these weapons are foremost in the victories of attainment. And from beneath their uniforms, between which there is so much of resemblance, there comes a speech that "bewrayeth" them They have a shibboleth that in public assemblies can be detected at the fords of any Jordan. It is the accent of a higher self-culture. The best ever written on agriculture, if unread, and the most carefully prepared bulletins, though they come as snowflakes for number, will avail us no more than waters of a current running on toward the sea, if they are unheeded.

Then there is the Ontario Agricultural College at Guelph, the waters of a mountain torrent rushing toward the plain, and potent only for good in proportion as they are utilized by the farmers of this country. The generating motive power of this institution is certainly capable of turning the shafts of an agricultural progress extending from sea to sea, but much of this accumulation of force is lost because it is allowed to run to waste. The water-wheel with head sufficient to grind one-hundred bushels per hour is certainly not doing its best work when kept grinding but twenty-five bushels, and this is just what is being done with that large water-wheel at Guelph. It is giving instruction to not more than 100 students at the present time, when it might as well give instruction to thrice that number. The staff is there in full force. The library is there, the farm is there with its equipments, but the students, the sons of our stalwart Canadian yeomen are not there but in limited numbers. The brick-kiln is there and the work hands, but not enough of clay and only a scant supply of straw, so that at the present time this College cannot furnish to the country the full tale of bricks. This waste of running waters is all the more to be deplored when we call to mind that their utilization is so much needed. The young men who remain upon the farm are in more need of a higher education than those who leave it for other callings, because of the larger amount of brain power and brain development that it requires to carry farm work on successfully than is required by most other callings material in their nature. Wherever, then, there is a waste of energy it should not be at this station because of the crying need, and it remains with the farmers of this country to see to it that the waters of this mountain torrent are utilized to the utmost as they rush toward the plain.

The extent to which rushing waters may be utilized is literally without limit. The stream that turns the wheel above can with equal ease turn the wheel below, and without any diminution but rather an accumulation of power, and this may be repeated in a never-ending succession until the plain is reached. Precisely similar are the results of the utilization of opportunity as indicated in this paper. The knowledge that is thus acquired is sure to be given out by its possessor: it never becomes the heritage of the miser, but is manifest in methods of superior farm practice and attainment, and is gladly given out by tongue and pen for the advantage of others. And these in turn transmit the heritage to an ever widening circle, so that its beneficent influences in all probability will never cease till they reach the confines of time.

There is an infinite pathos in the song that reminds us, that the miller can never grind his grist with "the waters that have passed." I would that every farmer's son in Canada could see himself a miller, and give diligent heed that the great grist of agricultural attainment should be ground before the waters are gone. I cannot but think that the huge mistake of humanity, even in material things, consists in allowing opportunities to run away which no more come again than the waters of the bounding rivulet. It seems to me that if there is any cancer that spreads its roots more vigorously into the vitals of old age than another, covering it with the pall of regretful shadows, it is the remembrance of "what might have been" had the waters of opportunity been utilized to the utmost as they bounded past.

FINANCIAL STATEMENT

OF THE

ELECTORAL DISTRICT FARMERS' INSTITUTES.

FOR THE YEAR ENDING JUNE 30, 1892.

Electoral Districts.	Date of Organization.	Receipts.	Disbursements.	Remarks.
		$ c.	$ c.	
Addington	Feb. 28, 1888	105 02	87 02	
Algoma, C	Feb. 12, 1891	85 95	70 50	
Algoma, E	Feb. 1, 1890	.....	.....	No report.
Algoma, W				
Brant, N	Oct., 1883	67 25	67 25	
Brant, S	Dec. 5, 1885	73 74	71 05	
Brockville	March, 1892	62 35	50 85	
Bruce, C	Aug., 1887	131 23	57 00	
Bruce, N	June, 1887	125 75	47 96	
Bruce, S	Dec. 1, 1887	373 94	107 31	
Cardwell				
Carleton	Jan. 31, 1890	148 44	109 48	
Cornwall	Jan. 11, 1892	51 50	48 25	
Dufferin	Nov. 26, 1887	.....	.....	No report.
Dundas	Jan., 1886	73 25	81 85	
Durham, E				
Durham, W	June, 1887	145 58	97 04	
Elgin, E	Jan., 1885	.....	.....	No report.
Elgin, W	Dec. 17, 1887	134 01	89 25	
Essex, N	Feb. 2, 1889	147 31	58 80	
Essex, S	Nov. 14, 1885	155 06	50 65	
Frontenac	March 10, 1888	146 81	105 62	
Glengarry	Jan. 8, 1887	96 15	104 60	
Grenville, S	Feb. 16, 1886	107 73	83 16	
Grey, C	Aug. 4, 1885	94 69	79 58	
Grey, N	July 28, 1885	93 15	34 88	
Grey, S	Oct. 20, 1885	260 14	167 37	
Haldimand	Jan. 19, 1887	132 43	69 75	
Halton	Jan. 9, 1886	129 63	55 72	
Hastings, E	March 31, 1891	121 77	54 76	
Hastings, N				
Hastings, W				
Huron, E	Jan., 1886	115 62	56 50	
Huron, S	Dec., 1885	160 88	101 20	
Huron, W	June 25, 1888	90 50	62 46	
Kent, E	Jan. 21, 1886	70 00	50 50	
Kent, W	May 3, 1886	154 33	66 98	
Lambton, E	Nov. 20, 1885	82 48	68 80	
Lambton, W	Feb. 17, 1892	54 50	49 51	
Lanark, N	Dec. 12, 1885	95 15	63 88	
Lanark, S	Nov. 25, 1886	80 70	69 30	

FINANCIAL STATEMENT.—*Continued.*

Electoral Districts.	Date of Organization.	Receipts.	Disbursements.	Remarks.
		$ c.	$ c.	
Leeds, N. and Grenville, N	1891	.....	.....	No report.
Leeds, S	Dec. 18, 1885	67 75	62 25	
Lennox	Dec. 19, 1885	138 20	50 50	
Lincoln	Jan. 25, 1886	136 72	89 25	
Middlesex, E	Jan. 23, 1886	100 50	60 64	
Middlesex, N	Jan., 1887	177 40	78 94	
Middlesex, W	Feb. 20, 1889	151 34	66 86	
Monck	Sept. 7, 1888	107 21	65 22	
Muskoka	March 19, 1890	70 10	30 66	
Niagara				
Norfolk, N	Dec. 26, 1885	162 76	106 77	
Norfolk, S	Dec. 11, 1885	72 37	31 44	
Northumberland, E	Feb., 1886	95 22	82 50	
Northumberland, W	June, 1886	129 33	73 15	
Ontario, N	Jan. 11, 1887	173 65	20 55	
Ontario, S	Nov., 1885	104 61	96 03	
Oxford, N	June 18, 1887	140 30	61 70	
Oxford, S	June 18, 1887	134 54	91 15	
Parry Sound	Feb. 7, 1891	50 75	50 75	
Peel	Jan., 1888	182 80	27 50	
Perth, N	April 6, 1888	115 60	103 10	
Perth, S	Jan. 26, 1889	94 45	82 55	
Peterborough, E	June 17, 1887	107 42	52 50	
Peterborough, W	Nov. 30, 1888	133 74	42 40	
Prescott	March 15, 1890	182 50	181 54	2 years.
Prince Edward	March 3, 1886	119 45	48 06	
Renfrew, N				
Renfrew, S	Jan. 29, 1884	131 07	47 25	
Russell	Nov. 17, 1888	92 84	74 05	
Simcoe, C	June 25, 1888	175 14	130 46	3½ years.
Simcoe, E	1889	83 25	56 00	
Simcoe, S	Jan., 1887	132 93	97 95	
Simcoe, W	Jan., 1886	70 00	66 29	
Stormont	Jan. 18, 1889	47 30	78 00	
Victoria, E	Jan. 2, 1886	137 15	38 82	
Victoria, W	Dec. 9, 1885	178 34	83 49	
Waterloo, N	Nov. 17, 1888	158 59	61 50	
Waterloo, S	April 2, 1886	.....	.....	No report.
Welland	March 24, 1888	194 50	121 50	
Wellington, C	Nov. 1, 1887	133 77	92 12	
Wellington, E	1888	43 50	9 70	
Wellington, S	May 16, 1886	231 28	225 02	
Wellington, W	Jan. 15, 1885	126 01	54 85	
Wentworth, N	Jan. 24, 1889	114 86	71 95	
Wentworth, S	Jan. 21, 1885	101 54	82 30	
York, E	June, 1886	183 72	87 20	
York, N	Nov., 1884	68 52	56 54	
York, W	Mar. 26, 1888	68 07	32 23	
Total	.....	9,388 13	5,662 06	

LIST OF SECRETARIES

OF

ELECTORAL DISTRICT FARMERS' INSTITUTES.

Electoral Districts.	Secretaries.	P. O. Address.
Addington	J. B. Aylesworth	Newburg.
Algoma, C	Frank W. Brown	Sault Ste. Marie.
Algoma, E	Fred. Leighfield	Thessalon.
Algoma, W		
Brant, N	Alfred Smith	St. George.
Brant, S	Thomas A. Good	Brantford.
Brockville	W. H. McNish	Lyn.
Bruce, C	William Bowes	Pinkerton.
Bruce, N	John Douglass	Tara.
Bruce, S	James A. Lamb	Walkerton.
Cardwell		
Carleton	R. H. Grant	Hazledean.
Cornwall	C. W. Young	Cornwall.
Dufferin	George Island	Orangeville.
Dundas	G. D. Dixon	Dixon's Corners.
Durham, E		
Durham, W	Albert Tamblyn	Orono.
Elgin, E	J. C. Dance	Kingsmill.
Elgin, W	Daniel Black	Iona Station.
Essex, N	N. J. Clinton	Windsor.
Essex, S	G. W. Coatsworth	Kingsville.
Frontenac	Alexander Ritchie	Inverary.
Glengarry	W. J. McNaughton	Lancaster.
Grenville, S	W. H. Thompson	Prescott.
Grey, C	J. I. Graham	Vandeleur.
Grey, N	James Smith	Owen Sound, Box 346.
Grey, S	George Binnie	Bunessan.
Haldimand	Charles Walker	Cayuga.
Halton	W. F. W. Fisher	Burlington.
Hastings, E	John Stokes	Thomasburg.
Hastings, N		
Hastings, W		
Huron, E	Arch. Hislop	Walton.
Huron, S	John Hannah	Seaforth.
Huron, W	William N. Howell	Carlow.
Kent, E	A. J. C. Shaw	Thamesville.
Kent, W	John Clarkson	Chatham.
Lambton, E	Joseph Osborne	Wyoming.
Lambton, W	W. S. Howell	Thornyhurst.
Lanark, N	John Steele, jr	Almonte.
Lanark, S	George Oliver	Perth.
Leeds N. and Grenville, N	Levi Patton	Oxford Mills.
Leeds, S	Freeman Britton	Gananoque.
Lennox	H. Aylesworth	Deseronto.
Lincoln	Jesse Pawling	Port Dalhousie.
Middlesex, E	John McDougal	Pond Mills.
Middlesex, N	George T. Johnston	West McGillivray.

LIST OF SECRETARIES.

Electoral Districts.	Secretaries.	P. O. Address.
Middlesex, W	A. McTaggart	Appin.
Monck	J. E. Cohoe	Wellandport.
Muskoka	Alex. Barron	Bracebridge.
Niagara		
Norfolk, N	F. L. Culver	Waterford.
Norfolk, S	Albert Gilbert	Simcoe.
Northumberland, E	J. B. Ewing	Dartford.
Northumberland, W	Richard Cullis	Camborne.
Ontario, N	E. D. Miller	Uxbridge.
Ontario, S	Ellsworth Annis	Oshawa.
Oxford, N	James Anderson	Strathallan.
Oxford, S	M. S. Schell	Woodstock.
Parry Sound	D. Macfarlane	Parry Sound.
Peel	J. T. Peacock	Humber.
Perth, N	Wm. Keith	Listowel.
Perth, S	P. S. Armstrong	St. Marys.
Peterborough, E	Chas. O'Reilly	Norwood.
Peterborough, W	John A. Davidson	Peterborough, Box 698.
Prescott	Wm. McAdam	Vankleek Hill.
Prince Edward	Alfred S. Yarwood	Picton.
Renfrew, N	John Delahey	Cobden.
Renfrew, S	James McLachlan	Renfrew.
Russell	W. R. Craig	Russell.
Simcoe, C	G. C. Caston	Craighurst.
Simcoe, E	R. Miller	Hobart.
Simcoe, S	H. B. Jeffs	Bond Head.
Simcoe, W	W. A. Furlong	Nottawa.
Stormont	C. W. Young	Cornwall.
Victoria, E	Wm. Thurston	Bobcaygeon.
Victoria, W	James Keith	Lindsay.
Waterloo, N	John F. McKay	Bloomingdale.
Waterloo, S	Andrew Elliott	Galt.
Welland	E. Morden	Niagara Falls South.
Wellington, C	George Wright	Elora.
Wellington, E	George Cushing	Kenilworth.
Wellington, S	P. Mahon	Aberfoyle.
Wellington, W	James McEwing	Drayton.
Wentworth, N	Joseph Stephenson	Freelton.
Wentworth, S	Erland Lee	Stony Creek.
York, E	J. C. Clark	Agincourt.
York, N	A. E. Starr	Newmarket.
York, W	R. L. Crawford	Richview.

SECOND REPORT OF

THE BUREAU OF MINES

1892.

PRINTED BY ORDER OF THE

LEGISLATIVE ASSEMBLY OF ONTARIO.

TORONTO:
PRINTED BY WARWICK & SONS, 68 AND 70 FRONT STREET WEST,
1893.

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To His Honor George Airey Kirkpatrick,
Lieutenant-Governor of Ontario :

I have the honor to transmit herewith, for presentation to the Legislative Assembly, the Second Report of the Bureau of Mines.

I have the honor to be, Sir,
Your obedient servant,

A. S. HARDY,
Commissioner of Crown Lands.

Department of Crown Lands,
Toronto, 15th May, 1893.

SECOND REPORT OF

THE BUREAU OF MINES.

To the Honorable Arthur S. Hardy,
Commissioner of Crown Lands:

Sir,—I am submitting herewith, for presentation to His Honor the Lieutenant-Governor, the Second Report of the Bureau of Mines.

Statistics are given of the areas of mineral lands sold and leased during the calendar year 1892, as well as of the mineral production of the Province for the year ending 31st October. Returns of the latter are made to the Bureau under the provisions of the 60th section of The Mines Act 1892.

Revival of interest in the iron industry suggested the importance of reviewing our past experience with blast furnaces in Ontario, and also of collecting information on the iron ore resources of the Province. Accordingly some space is devoted to these subjects. All statements have been carefully verified, and have been drawn chiefly from official documents and scientific reports and papers.

Separate chapters are also devoted to nickel and its uses, the peat industry, the mining laws of the Province and other subjects, including a very interesting paper by Prof. Coleman on our exhibit of minerals at the World's Fair.

Under the 67th section of The Mines Act 1892 the Inspector of Mines is required to make an annual report of his proceedings to the Director of the Bureau, and his Report accompanies this Report of the Bureau.

I have again to acknowledge the valuable services of Mr. Thomas W. Gibson in the conduct of the affairs of the Bureau. He is a faithful, exact and capable officer.

I have the honor to be, Sir,
Your obedient servant,

ARCHIBALD BLUE,
Director.

Office of the
Bureau of Mines,
Toronto, May 15, 1893.

REPORT OF

THE BUREAU OF MINES.

I.

STATISTICS.

Statistics of mineral production and grants of mineral lands.

The sixtieth section of The Mines Act 1892 requires the owner or agent of every mine to which the Act applies to send to the Bureau of Mines on or before the first of December of each year the statistics of his mine for the year ending on the preceding 31st day of October, according to a form prepared and furnished for this purpose by the Director of the Bureau. The information which the Act requires to be given in this way covers the number of persons employed at the mine above and below ground respectively, the number of such persons over seventeen years of age, the number between fifteen and seventeen years, the average rate of wages earned by workers in each class, and the total amount of wages paid during the year, together with the quantity in statute weight of the mineral dressed and undressed which has been sold, treated or used during the year, and the value or estimated value of it. The Act makes every owner or agent of a mine who fails to comply with this provision of it, or who makes any return which is to his knowledge false in any particular, guilty of an offence for which he is liable to a penalty of fifty dollars, and to a further penalty of five dollars for every day the offence continues after written notice of it has been given. The returns received have not been altogether satisfactory, but doubtless they will improve when the requirements of the Act are better understood and the value of statistics come to be better appreciated by mining men. The statistics of the sale and lease of mining lands have of course been prepared from the records of the Department of Crown Lands. In respect of number of grants for which patents and leases have been issued, as well as of areas conveyed, it will be observed that the districts of Algoma and Nipissing continue to keep the lead. These are the best known mineral regions of the Province, and the most valuable minerals are found within their limits, including gold, silver, nickel and copper. Until recently gold was supposed to be found in workable quantities only in Hastings and in the region in and around Lake-of-the-Woods. But within the last two years promising leads have been discovered in the valleys of the Thessalon and Vermilion rivers in Algoma, and in the vicinity of lake Wahnapitae in Nipissing, and prospecting has been active in those regions, with the result that quite a number of locations have been taken up. Important discoveries of silver, copper and antimony ores have also been reported in the township of Barrie in Frontenac, and of steatite in Grimsthorpe in Hastings, and in both townships prospectors were busily employed last year.

SALE AND LEASE OF MINING LANDS.

Mineral lands sold

Under the new Act mining lands may be acquired by purchase of the fee simple, or by lease for a term of years with right of renewal. The following table shows by districts the areas for which mining patents were issued in 1892, and the amounts paid therefor into the treasury of the Province :

District.	No. of Patents.	Acres.	$
Rainy River	27	1,144	3,109.00
Thunder Bay	12	2,391	5,598.00
Algoma	12	1,500	4,214.50
Nipissing	10	779	1,706.50
Elsewhere	4	386	645.00
Totals	65	6,200	15,273.00

No fair comparison can be made with the sales of the previous year, for the reason that in 1891 a large number of patents were issued for which application had been made under the provisions of the old Act. Besides, the preference is now for taking land under the leasing system.

and leased.

The next table shows the number of mining leases issued during the year, the acreage which they covered, and the amount paid into the treasury for the first year's rent charge :

District.	No. of Leases.	Acres.	$
Rainy River	9	1,517	1,517.00
Thunder Bay	6	990	990.00
Algoma	32	4,842½	4,842.51
Nipissing	34	3,747½	3,749.25
Elsewhere	14	2,026	1,215.60
Totals	95	13,122½	12,314 36

Popularity of the leasing system.

The leasing clause went into operation on 4th May, 1891. The number of leases issued in that year was 47, embracing an area of 4,998 acres, and the first year's rental paid was $4,886. The average area of locations was 100 acres, while in 1892 it rose to 138 acres, and the number of leases issued was doubled. A reason for the larger number of leases granted in the latter year is found in the fact that a third of the previous year had passed before the system was brought into effect ; yet this is to be said, that little or no prospecting for minerals in our northern districts can be undertaken before the first of May.

As evidence of the continued growing favor of the system with miners and prospectors, it may be stated that the number of mining leases issued to May 6th of the current year is 54, covering an area of 6,656 acres. The number of patents issued to the same date is 30, covering 2,912 acres. It is probable therefore that the transactions of this year will considerably exceed those of last year.

Payments of the second year's rental fell due last year upon 27 locations, covering 2,461½ acres, to the amount of $603. The rent charge for the second and all subsequent years of the term of a lease is only one-fourth of the rate for the first year.

MINERAL STATISTICS.

Building Stone.

About one hundred quarries were worked during the year for building stone material, chiefly limestone and sandstone. It was not possible to procure returns from all of them, but a careful estimate gives the following statistics of quantity and value for the different classes of material :

Dimension Stone	cu. ft.	2,600,000	$680,000
Heads and Sills	cu. ft.	50,000	26,000
Coursing Stone	sq. yd.	64,000	42,000
Rubble, etc	cu. yd.	730,000	132,000

Making a total value of $880,000. The amount of wages paid to workmen was $730,000.

Natural Rock and Portland Cements.

Much the greater portion of the cement made in Ontario is the product of natural rock, but although the quantity was 7,977 barrels more than in the preceding year the value was $839 less. Portland cement began to be made in 1891, when the output was 2,033 barrels, valued at $5,082. The quantity and value of both classes produced last year are given in the following table :

Natural Rock	bbl.	54,155	$38,580
Portland	"	20,247	47,417

Making a total of 74,402 barrels, valued at $85,997. The amount paid for wages was $53,151.

Lime

The returns received of the quantity of lime burnt last year are not complete, but an estimate places it at 2,600,000 bushels, valued at $350,000, with amount for wages of $120,000.

Brick, Roofing Tile and Terra-cotta.

The following table gives the quantity and value of drain tile, common and pressed brick, roofing tile and terra-cotta made in the Province last year —drain tile and common brick being an estimate based on 161 returns :

Drain Tile	No.	10,000,000	$100,000
Common Brick		175,000,000	980,000
Pressed Brick, plain		20,342,000	198,350
Pressed Brick, fancy		1,323,000	32,253
Roofing Tile		383,000	8,613
Terra-cotta			20,119

The pressed brick works have added largely to the output of 1891, the increase in the number of pieces being 8,431,000, and in value $102,636. One new establishment was put into operation during the year, that of the Thomas Nightingale Pressed Brick Co. at Port Credit. The brick at these works is made from the red shale of the Medina formation. The amount paid for wages during the year by the pressed brick companies was $88,865. The amount of wages paid for making common brick and drain tile was $445,000.

Pottery.

The value of pottery made during the year was $80,000, and the amount of wages paid to workmen in the business was $25,000.

Gypsum.

The gypsum mining industry has been quiet during the year and production was only 72 per cent. of the previous year's. There has been however a considerable increase in the manufacture of alabastine and plastico. Following are the figures for the year :

Gypsum	tons	3,870	$14,100
Alabastine and plastico	"	108	11,800

The amount paid for wages was $10,465.

Phosphate of Lime

The depression in the phosphate business still continues as a consequence of the low price at which Florida phosphate is sold in the European mar-

kets. Only three of the Ontario mines were worked last year, and these to much less than their full capacity. The total quantity raised was 2,381 tons, valued at $23,810. The amount paid for wages, including some development work on other mines, was $9,400.

Salt.

The total quantity of salt of all kinds made during the year ending October 31, as reported to the Bureau by Mr. John Ransford, secretary of the Association, was 43,387 tons, valued at $162,700. It has not been possible to get information in detail, but the following figures are compiled from returns made by the owners of six salt works :

Coarse salt	tons 2,550	$ 9,005
Fine salt	" 8,221	35,461

The cost of wages for this quantity of coarse and fine salts was $9,885. Computed at the same rate the cost of wages for the total make of the year would be about $37,800.

The salt-producing territory of the Province was proven last year to extend as far south as Windsor. A well drilled at the Canadian Pacific Railway station struck a bed of salt 30 feet in thickness at a depth of 1,138 feet. In the township of Orford, in Kent county, a deep well drilled in 1890 for natural gas by Mr. Hiram Walker, of Walkerville, went through a bed of clear white salt 171 feet in thickness, reaching it at a depth of 1,510 ft.

The salt beds of the Province are proven by borings and producing wells to extend under the whole of the counties of Huron, Lambton, Kent and Essex, as well as portions of Middlesex and Bruce, and to cover an area of about 4,000 square miles. Near the borders of the formation the salt thins out to one bed, but in Huron there are usually to be found three distinct beds, separated by shale, whose aggregate thickness is about 90 feet. The greatest known thickness of a deposit is in the southern limit of the field where, as shown by the record of Mr. Walker's boring in Orford, there is one bed 171 feet in thickness.

Mica.

Only one of the mica mines was worked last year and it produced but seven tons, valued at $1,500. The amount of wages paid for labor was $150.

Nickel, Copper and Cobalt.

Four companies carried on mining and smelting operations in the Sudbury district last year. The quantity of ore raised was 72,349 tons, and the quantity smelted was 61,924 tons. Three of the companies have erected bessemerizing plants in connection with their works, employed to enrich the matte ; but only a portion of the matte is treated by this process. The quantity of ordinary matte produced at all the furnaces was 6,278 tons, and of bessemerized matte 1,880 tons. The following table gives the estimated metal contents of these mattes and their values at the works:

Nickel	tons 2,082	$590,962
Copper	" 1,936	232,135
Cobalt	" 8½	3,713

The total value of the metal contents therefore was $826,750, the nickel being calculated at $284 per ton or 14.2 cents per pound, the copper at $120 per ton or 6 cents per pound, and the cobalt at $437 per ton or 21.84 cents per pound.[1] All the ores yielded nickel, the average being 3.36 per cent ;

[1] The quantities here given are the estimated contents of the respective refined metals in the mattes, but values are computed on the selling price of mattes at the works and not on the price of the metals after they have been refined in Great Britain, the United States or elsewhere. London quotations for nickel ruled steadily at 42 cents per pound, and New York quotations at 48 to 52 cents, during the latter half of the year,—the higher price in the United States being maintained by the protection of the customs duty. But it would be very misleading to make the value of nickel contents in the matte at Sudbury the same as the value of refined nickel in New York or London.

the ores of three companies yielded copper, the average being 3.19 per cent.; and the ores of one company yielded cobalt, but the average was only .1007 per cent.

Employment of labor. At the mines there was employed underground an average of 197 men and above ground of 243 men over seventeen years of age, while of boys under seventeen years of age there was employed an average of only 10, all above ground. The average number of men employed at roasting and smelting was 240,—the average of all classes of workers being 690. The mines of one of the companies were worked 310 days, of another 261, of a third 173, and of the fourth 155. The smelting works of one company were in blast 337 days, of a second 290, of a third 67, and of the fourth 32. The aggregate of time of labor in the mines may therefore be computed at 105,890 days, and at roasting and smelting 52,428 days, making a grand total working time of 158,318 days for the 690 employés. The amount of wages paid for labor by the four companies was $339,821, and the average wage per day would therefore be 2.14\frac{2}{3}$.

Gold. Gold mining has been comparatively active during the year, but the work carried on has been mostly of development character. Locations have been worked in the county of Hastings, in the district of East Algoma and in the region of Lake-of-the-Woods. Nine companies have made returns of work done during the year ending 31st October, which show that 3,710 tons of gold ore was mined, the value of which is estimated at $36,900. The number of men employed above ground by those companies was 85, and the number underground 40. The aggregate working time of the men was 12,932 days, and the amount of wages paid was $22,750. The average wage per day would therefore be $1.76.

Mills for treating the ore were being erected at a number of mines, several of which are now in operation. New processes of treating ore are being adopted, and interesting results are looked for this year.

Operations on Lake-of-the-Woods. In the month of December eight properties were in course of active development on Lake-of-the-Woods, the number of mines and laborers employed upon them being 159. Since then reduction mills put up at two of the mines have, it is reported, been treating the ores very successfully. According to accounts published in the Rat Portage newspapers, gold bricks of the value of $1,000 are produced by each plant weekly.

Ophir mine. The Ophir mine, north of Thessalon, was purchased last year by a Duluth syndicate for $100,000. Several shafts have been sunk on the vein and the show of gold has aroused lively expectations. Treating works are being erected at the Ophir, and it is expected that they will be started in the month of August.

Creighton mine. The Creighton Gold Mining Co. is developing a location of much promise in the township of Creighton, west of Sudbury. Sixty-three men were employed on the works in February, at which time a shaft of 8 by 9 feet was sunk upon the vein to the depth of 110 feet. Steam drills and hoists were in operation at that time, but air compressors, crushers and other machinery had been ordered and suitable buildings were in course of erection.

Operations in Hastings. Three mines are being worked in the county of Hastings, one of which has reached a depth of 140 feet. The pyritic ore at this latter mine is being treated in a Crawford mill, and the yield of gold is stated to be very satisfactory. At one of the other mines a new process of treating mispickel ore is going to be tried, which is claimed to give good results in the laboratory.

Silver.

Nearly all the silver mines in the Lake Superior district have been idle during the past year, and the work done on five or six locations had for its chief object the opening and proving of veins. This is one of the results of the depreciation of silver. An accompanying result is the activity noticed in gold mining, which is also a feature of the industry in the United States and elsewnere.

At one of the mines six men were employed under ground and one above ground for 306 days, and the amount of wages paid for labor was $3,942, or at the rate of $1.84 per day. Ten tons of ore was taken from this mine, the value of which is put down at $732.

Petroleum.

The quantity of crude petroleum produced in the Petrolea and Oil Springs fields was 800,000 barrels (28,000,000 imperial gallons), valued at $1,000,000. This is 94,647 barrels less than for the preceding year.

Full details of the industry have not been obtained, as only five refineries have made returns to the Bureau. These refineries treated 11,929,446 gallons in the year, being 42.6 per cent. of the whole yield, the product of which is given in the following table:

Illuminating oil	imp. gal.	4,627,593	$391,628
Lubricating oil	"	1,472,924	58,918
All other oils	"	3,260,912	116,118
Paraffin wax	lb.	276,027	29,922

The amount of wages paid for labor at those five refineries was $40,517. On the same basis, the refined product of the total crude yield of the year would be—

Illuminating oil	imp. gal.,	10,862,894	$919,315
Lubricating oil	"	3,457,570	138,304
All other oils	"	7,654,723	272,577
Paraffin wax	lb.	647,950	70,239

This would give a total value of distilled products of $1,400,435, and at the same rate the amount of wages paid for labor would be $95,110. This does not of course include wages paid to workmen employed in the production and storage of crude petroleum. The total number of employés maintained by the industry is estimated to be about 1,500, and the amount of wages paid for labor of all kinds about $650,000.

Natural Gas.

In the Welland gas field forty-nine wells were bored last year, of which thirty-six are gas producers. The total number of producing wells in the district is sixty-five. In Essex two new producing wells were bored last year, and there are now eight in that district. There are about one hundred and fifty miles of pipe laid for the delivery and distribution of gas in both districts, and the value of gas sold to consumers last year was about $160,000. The total amount of wages paid for labor was $55,000, a large proportion of which was for drilling new wells. The returns received from gas companies have not been very satisfactory, especially those made by companies delivering to consumers in Buffalo.

Iron.

No iron mining is reported for the year, but several properties were prospected with a view of proving the quantity and value of their ores.

SUMMARY OF MINERAL PRODUCTION.

Product.	Quantity.	Value. $	Wages. $
Dimension stone....cu. ft.	2,600,000	680,000	
Heads and sills .... " "	50,000	26,000	730,000
Coursing stone ....sq. yd.	64,000	42,000	
Rubble, etc .....cu. yd.	730,000	132,000	
Natural Rock Cement..bbl	54,155	38,580	53,151
Portland Cement ..... "	20,247	47,417	
Lime ... .bu.	2,600,000	350,000	120,000
Drain Tile..... no.	10,000,000	100,000	445,000
Common brick..... "	175,000,000	980,000	
Pressed brick, plain ... "	20,342,000	198,350	
Pressed brick, fancy... "	1,323,000	32,253	88,865
Roofing tile .... "	383,000	8,613	
Terra-cotta ..... "		20,119	
Pottery ..... "		80,000	25,000
Gypsum.....tons	3,870	14,100	10,465
Alabastine and plastico "	108	11,880	
Phosphate of lime ..... "	2,381	23,810	9,400
Salt..... "	43,387	162,700	37,800
Mica ..... "	7	1,500	150
Nickel .... "	2,082	590,902	
Copper ..... "	1,936	232,135	339,821
Cobalt ..... "	8½	3,713	
Gold ore ..... "	3,710	36,900	22,750
Silver ore ..... "	10	732	3,942
Petroleum ..... imp. gal.	28,000,000		
Illuminating oil " "	10,862,894	919,315	
Lubricating oil " "	3,457,570	138,304	650,000
All other oils .. " "	7,654,723	272,577	
Paraffin wax .....lb.	647,950	70,239	
Natural gas	....	160,000	55,000
Totals	.....	5,374,139	2,591,344

Quantity and value of mineral production, and amount of wages paid for labor, in 1892.

The total value exceeds the production of last year by $668,466; but the principal increase is in nickel and copper, in which there is a different basis of values for the two years. The table, it may be explained, gives no

No statistical account of exploratory work.

account of properties upon which exploratory or development work was done during the year. Of these there are a considerable number, especially in the gold and nickel fields. In some cases numerous test pits and shafts have been sunk and several hundred tons of ore raised ; a work which, though not included in statistical returns of quantity, value or wages, may come to have an important effect on the future of mining operations in the Province.

Correspondence.

As was stated in the Report of last year, all transactions relating to sales and leases of mining lands in the surveyed territory of the Province has been assigned to the Bureau of Mines, which of course includes all correspondence in respect of such transactions. The number of letters written by the Bureau last year, including this branch of its work, was 1,417 ; but there was sent out in addition 125 notices to lessees of mining lands *re* rentals, and over 1,000 circulars and schedules for the collection of mineral statistics.

II.

IRON-MAKING IN ONTARIO.

A commonwealth without a blast furnace.

For a country which has had self-government a hundred years, which has a population of more than two millions and a school system of unsurpassed excellence to provide for their education, which possesses rich resources of soil, timber and minerals, including iron ores, which sustains varied industries, and which has large amounts of capital invested and seeking investment, much of it employed in the neighboring States,[1] the Province of Ontario is singular in being almost alone among the great commonwealths of our continent without a blast furnace for the production of metallic iron.

Iron-making has been undertaken at different times and at various places in the Province, but in almost every instance by men without skill or experience, and with only very limited means.

Blast Furnace at Gananoque Falls.

Iron making in Leeds county.

The first blast furnace in Ontario was built by a company in the county of Leeds about the year 1800, at the falls of the Gananoque river. It was an old-fashioned stack, and in connection with it was a forge for the manufacture of bar iron. But the location was too far from ore deposits, having regard to the difficulties and cost of transportation at that early period in the history of the country, and as the ore used was of inferior quality and had to be drawn a considerable distance the venture was abandoned after a trial of two years.[2]

Blast Furnaces in Norfolk County.

Iron making in Charlotteville and Houghton, in Norfolk county.

The next furnace was started about twenty years later, in the township of Charlotteville, county of Norfolk, to smelt the bog iron ore in that district, and it was carried on successfully for a quarter of a century, or until the supply of ore in the locality became exhausted. The smelting of iron appears to have commenced early in 1823, as under date of 15th January in that year the proprietors, Messrs. Joseph VanNorman, Hiram Capron and George Tillson, petitioned the Lieutenant-Governor in Council for leave to take and use ores in the locality, the property of which was in the Crown.

"The petition of the undersigned owners in the concern of VanNorman and Company, being the proprietors of the iron works established on lot No. 16 in front of the first concession of Charlotteville, in the district of London, most humbly sheweth : That your petitioners have their said iron works now at this time heating for the purpose of going immediately into operation :[3]

[1] The bank statement in the Canada Gazette for the month ending February 8, 1893, showed that there was due to Canadian banks from their own agencies and other banks in foreign countries at that date $21,397,371, while there was due to the latter from the former only $87,710. The balance, $21,309,661, represents the amount of our cash or capital abroad, all or nearly all of which is used for commercial purposes in the United States, but which may be called in whenever it is wanted. At the same date there was due from British banks $1,159,930, and due to them $4,766,619.

[2] Hiel Sliter's Recollections in Leavitt's History of Leeds and Grenville, p. 62.

[3] In a paper furnished by the late Mr. VanNorman, about eight years ago, it is stated that the furnace had been completed and put in blast in 1822, but the statement in the petition is no doubt more authentic. The work of constructing the furnace was begun by John Mason, in 1815, but the inner wall collapsed when only a few tons had been smelted. Mr. Mason died soon after, and the property was acquired by Mr. VanNorman.

That your petitioners trust their said iron works are upon such a scale that they will be found fully efficient for all the purposes required, and therefore pray that your Excellency will be pleased to grant them the privilege of taking and using, from time to time, for and at their said works, such iron ore as may be required from any place or places where the same may abound within the townships of Charlotteville and Middleton."

Iron ores reserved to the Crown.

The patents issued in Upper Canada down to the end of 1823 reserved iron ores to the Crown, except in rare instances; but the petition of the company was no doubt intended to cover the acquisition of ores found upon all lands in the townships named, whether the title to such lands had passed to settlers or was still in the Crown. The report to Council however assumed that the petition only referred to ores on patented lands, and instead of conceding to the company the privilege to take and use them, it was recommended that this privilege should be accorded to the owners of the land.

"It is respectfully submitted that the proprietors of land in Charlotteville and Middleton may be discharged from the restraint in their respective patents as to digging and disposing of iron ore, should it be the opinion of his Majesty's law officers that it may be, and if otherwise that his Majesty's Government may be moved to authorize such discharge."[4]

A second furnace for treating bog ores in the county of Norfolk was built by Mr. VanNorman in the township of Houghton in 1854, with the object of supplying the Great Western Railway with pig iron for the manufacture of car wheels, but the iron proved to be unsuitable and the furnace was blown out.[5]

The Marmora Iron Works.

Iron making in Hastings county.

In 1820 Charles Hayes began to take steps for making iron at Marmora, in the county of Hastings, and a furnace which was erected there to smelt hard magnetic ores had the ill-fortune to ruin or cripple three or four successive owners in the course of forty years, although for the greater part of that time it was out of blast. Little is known of the early history of this enterprise, but the Departmental and Executive records show that it received some measure of encouragement at the hands of the Government and the Legislature. The first reference to it appears under date of October 26, 1820, when the following Order in Council was adopted:

Land grants by the Government for site of works and fuel reserve.

"Mr. Charles Hayes being heard on a proposition to establish iron works at the Crow river in the township of Marmora, in the Midland district, his Excellency with advice of Council was pleased to grant permission to him to open a road from the Crow lake to Louis Rosebush's in Sydney, as nearly on a straight course as the reserve for roads in the respective townships will admit, and to erect works near to the said lake on Crow river, promising to confirm a location of twelve hundred acres comprehending the site of the works and the buildings inhabited by the labourers by grant of the land so soon as the Executive Government shall be satisfied that works are so complete as to manufacture bar iron and hollow ware; and his Excellency with the advice aforesaid promises to reserve other twelve hundred acres in the neighborhood to supply fuel for the works, and that the grant of land be without the Crown fee, paying only the fee to the patent officers. It is further ordered that he be preferred for one year in the lease of such Crown or Clergy reserves as may be found within this grant and the reserve for fuel.[6]

The tract reserved under the last clause of the Order included the whole of the first and second and part of the third concessions of the township, sub-

4 Orders in Council Book No. 6, p. 24.

5 See Report of Commission on the Mineral Resources of Ontario, pp. 319-20 and 326.

6 Orders in Council Book No. 5, p. 190.

sequently changed to the half of the first, second, third and fourth concessions, and covered with Marmora lake an area of 12,000 acres.[7]

On 1st October, 1821, Mr. Hayes applied for an extension of time as preferred lessee of this block, stating that he was then deeply engaged in the erection of his works and had "a vast number of men employed."[8]

On 7th June, 1823, he memorialised the Government for issue of the patents for the grant of 1,200 acres located as a site of the works, "having fulfilled the conditions of the Order in Council of 26th October, 1820;" and as the patents were issued in August following it is to be inferred that the furnace as well as the works for the manufacture of bar iron and hollow ware were then completed.[9]

In the same memorial Mr. Hayes petitioned for an enlargement of the fuel reserve from 1,200 to 1,800 acres, and that by act or instrument the grant thereof should be confirmed to him in perpetuity, which request the Council disposed of by the following Order:

"That six hundred acres of land adjacent to the reserve for fuel, for the iron works in Marmora, be added to that reserve, and the whole tract so reserved remain to the use of the iron works so long as they are improved as such without interruption of more than three years."[10]

Subsequently Mr. Hayes obtained permission to dig for and use ore of any description excepting gold and silver on any Crown or Clergy land leased by him.[11]

New reserve of lands for iron ores.

With respect to the reserved tract of 12,000 acres in Marmora, Mr. Hayes discovered that the deposit of ore upon which he relied was outside of its limits, and he submitted to the Government an offer to make a survey of three adjoining townships in which iron ore was likely to be found and to accept a percentage of the lands as his compensation for the work. Accordingly on 30th October, 1821, the following Order in Council was adopted:

"Upon the representation of Mr. Charles Hayes that the bed of ore on which he relied for supply of his contract with his Majesty's Government for iron ballast is discovered to be out of the limits of the reservations made for such purpose, and is likely to be found in the townships of Mora, Ninia or Carlos,[12] and that to obviate any risk of such ore falling into the hands of strangers by the draughts of the surveyors employed to survey the same, and proposing to undertake the survey of these townships at the low rate of four per cent. on condition of being permitted to locate such percentage in a manner to cover the iron ore: his Excellency the Lieutenant-Governor with the advice of the Council is pleased to order and direct that the Surveyor-General do contract with Mr. Hayes on the terms proposed for the survey of the said townships.[13]

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7 Orders in Council Book No. 5, p. 251, 9th March, 1821. The reserve block is shown on the original map of the township by a shaded border.

8 Writing to the Governor's secretary on 26th February, 1821, Mr. H. said: "Having had a survey made from the 13th lot in the first concession of Rawdon in a straight line to the rear thereof, and thence to the Crow lake in the township of Marmora, I have now had a road cut throughout which I imagine will be 15 miles in length."

9 J. H. Bartlett of Montreal states that the iron works were first commenced at Marmora by Mr. Hayes in 1830. "The Manufacture, Consumption and Production of Iron, Steel and Coal in the Dominion of Canada," p. 29. Also Transactions of the American Institute of Mining Engineers, vol XIV, p. 527, by the same writer. But the property had passed into the hands of Hon. Peter McGill before that year as principal creditor of Mr. Hayes, and in 1828 he petitioned the Legislature for a loan of £10,000 to enable him to carry on the works.

10 Orders in Council Book No. 6, p. 46. An absolute grant of the property was made by the Crown in 1853, upon payment of 10 cents per acre. 11 Ib. p. 47.

12 Now known respectively as Belmont, Lake and Methuen. Among other curious names of townships in those days in that part of the Province were Alma, Emir, Zeta, Aye, Yea, No, Et, Jus and Norma. O. C. Book No. 5, p. 357.

13 Orders in Council Book No. 5, p. 368.

located in Belmont.

In the summer of 1823 the surveys were well nigh completed, and Mr. Hayes solicited the Government for permission to locate in the township of Belmont the whole of his percentage for the three townships. The grounds of this request were, (1) "that the great body of iron ore on which your memorialist relies is within the township of Belmont," and (2) "that in the said township of Belmont is a lake to which from your memorialist's works is a line of water communication, and from which said lake your memorialist has it in contemplation to cut at some future period a canal to connect it with the river Trent, which would be of great importance in transporting iron and other commodities from the said works to the Rice lake, and *vice versa*, and would also be very beneficial to the public."[14] The patents were issued in July, 1824, and covered areas of 8,534 acres in Belmont, including lot 8 in the first concession, upon which is the Big Ore bed or Blairton mine. From this mine most of the ore smelted at the Marmora furnaces was taken.

Business difficulties.

But Mr. Hayes appears to have already become involved in business difficulties, for in September of the same year he made an assignment in trust of a portion of his property, including the land upon which the works were built, to Peter McGill, Anthony Manahan and Robert Hayes. In February, 1825, Messrs. McGill and Manahan surrendered their trust to Charles and Robert Hayes, and in June the property was sold in part to Mr. McGill, who carried on the works for some time in this and the following year. In 1828 Mr. McGill sought, but unsuccessfully, to enlist the aid of the Legislature, having applied for a loan of £10,000, and in October, 1830, he sold the property to Mr. Hetherington.

Marmora Foundery Co. incorporated.

An Act to incorporate the Marmora Foundery Company was procured from the Legislature in the session of 1831, upon the petition of Messrs. Hetherington, McGill and Manahan, with an authorized capital of £50,000, the object as set forth in the preamble being to acquire the Marmora iron works, at that time the property of Mr. Hetherington, to the end that "the said iron works and manufactory should be conducted on an extensive scale, so that his Majesty's subjects in this Province may have a cheap and accessible market for a supply of iron wares independent of any foreign country." A further object as set forth was that "the said Company will be capable of furnishing such ordnance, military and naval stores in the line of their trade as his Majesty's Government may require in this Province in peace or war."[15] This corporation continued to exist at least in name until 1853, when the charter was amended under a new set of directors; but the records of the county registry office show that in 1834 Mr. Hetherington reconveyed the property to Mr. McGill.

Report on a scheme to utilize penitentiary labor in iron making.

The report of the Commissioners appointed in 1837 to ascertain upon what terms the lands and works of the "Marmora Iron Works" might be acquired by the Government, for the purpose of employing the convicts of the penitentiary in the production and manufacture of iron at Marmora, showed that the quantity of land held in fee in the two townships was 10,935 acres, besides the 1,800 acres of fuel reserve.[16] It also appears by this report that the works consisted of two furnaces for smelting ore, a casting house common to both, a forge for the manufacture of bar iron, four coal houses with a capacity of 35,000 bushels each, saw and grist mills, blacksmith's shop, carpenter's shop, store, dwellings, etc., "forming in the view of the Commissioners a more complete and substantial establishment than on its scale of magnitude can be met with in all North America." The value placed by

[14] Memorial to his Excellency Sir Peregrine Maitland, 14th June, 1823.

[15] An Act to incorporate certain persons under the style and title of the Marmora Foundery Company, passed 16th March, 1831.

[16] Twelve hundred acres of the land in fee was purchased from a private owner (C. A. Hagerman), and the rest was acquired by grant from the Crown. Report of the Commissioners on the Removal of the Penitentiary from Kingston to Marmora, Appendix to Journal of the Assembly of Upper Canada, Session 1839, vol. II, pp. 239 and 248.

Mr. McGill on this property in his offer to the Commissioners was £25,000, including the land, and if the statements made by the Commissioners were trustworthy the wonder is that the works should have been allowed to remain idle.

The Big Ore bed in Belmont.

Referring to the supply of ore at the Big Ore bed, they describe it as a mountain on the shore of Crow lake entirely composed of iron ore. "Inasmuch as the Commissioners had never before a conception of such a quantity of ore in one mass in such a position, their surprise was exceeding, for the first consideration that must be given to this locality is that it is inexhaustible for all the purposes which may be forever required for this Province." They also found that with a boat of fifty tons navigated by four men one hundred and fifty tons of ore from the head of the lake might easily be brought to the works in two days, so readily was it quarried and put on board there.[17] The extent of this ore body is better known now, but the impression produced upon the minds of the Commissioners was doubtless an effect of novelty.

A furnace record.

As to the profits of the business, the report gave the following figures of actual cost and production as shown by the record of the new furnace for a campaign of five months:[18]

STATEMENT OF THE EXPENSES OF WAGES INCURRED IN THE WORKING OF THE NEW FURNACE, BLAST COMMENCING ON THE 15TH DAY OF DECEMBER, 1825, AND ENDING ON THE 15TH DAY OF MAY, 1826

	£.	s.	d.
To the founder, John Jones, 152 days at 15s. per diem	114	0	0
To 2 firemen, Campbell & Dyer, 152 days at 6s. 3d. each per diem	95	0	0
To the ballast moulder, Seagriff, 152 days at 5s. per diem	38	0	0
To 2 top-men or tillers, 1 banksman and 1 ore-burner at $24 per month each	120	0	0
To 1 gutter-man at $20 per month	25	0	0
To the carpenter who attended the bellows, 1s. per day extra wages, 152 days and $12 allowed for the blast	10	12	0
To the average labor of 2 men each day employed in making log-heaps, filling ore, raising clay and sand, etc., 152 days at 3s. 3d. per diem	24	14	0
To the expense of 600 bushels of coals each day for 152 days, at 21s. 6d. per hundred	980	8	0
To the average quantity of ore, 4 tons per diem, for 152 days, at 5s. per ton	152	0	0
To allowance for candles, oil, tar, etc, for the casting-house, moulding, and use of bellows, at 1s. per diem for 152 days.	7	12	0
Total expense	1,567	6	0

During the blast she cast as follows, viz:

In December	90½ pigs
January	316 do
February	341 do
March	483 do
April	466 do
May	218 do
Total	1,914½ pigs

Say 1,914½ pigs, equal to 273½ tons, which at £15 10s. Currency net at Kingston (allowing 40s. per ton, take the actual expense of transportation thither), will amount to £4,239 5s., showing the gain by the furnace in the five months' blast as follows, viz:

The proceeds at Kingston	4,239	5	0
Deduct the amount of expenses as set forth	1,567	6	0
Profit she has actually made	2,671	19	0

In this statement no charge is made for interest upon the capital invested. At Mr. McGill's valuation of £25,000 this would amount at 6 per cent. to

[17] Report, p. 238. [18] Report p. 245.

£625 for the five months, which would still show a profit made by running the furnace for that time of more than £2,000 The allowance for wages, it will be noticed, is fairly liberal even at present rates ; but 4½ cents per bushel for charcoal and $1 per ton for ore are low figures. On the other hand, $62.50 per ton for pig iron is nearly four times the price of charcoal pig at the present time in Michigan.

Importance of the works.

Commenting upon the statement and other facts elicited by their enquiry the Commissioners observed in their report that they "serve to show the importance of the works, if even conducted upon the moderate scale of operations upon which they have hitherto been managed, by which it appears that by the operations of only one furnace in blast for the year, and the forges making but three tons of bar iron per week, an annual profit of £13,037 18s. 6d. was estimated to accrue, after paying all the contingencies chargeable on the operations producing it, and valuing the produce at a net price under the market rates, deducting charges of transport and sale ; a profit (independent of the advantage to the country of having even so much of the supply of so necessary an article of consumption as iron furnished within ourselves) which would cover the first heavy outlay of building and otherwise preparing for the safe-keeping and accommodation of the convicts in the event of transferring them to the establishment. But the Commissioners cannot contemplate the probability of confining the operations of an establishment like this, and of one of the manufactures in the rank of utility most essential to mankind, with the unequalled privileges and advantages which the works possess, to be confined to the making of a few hundred tons of castings and bar iron every year—while the Province is annually disbursing hundreds of thousands of pounds for that commodity from abroad which could be profitably produced at home of a far superior quality and at a diminished price. Independent especially of the great importance which the establishment would prove to the Queen's Government in the time of war, as a resource to supply all the ordnance and munitions of war in their line, a resource contemplated with approbation by the Home Government when to foster the iron works into existence they gave a contract to Mr. Hayes for the delivery of pig iron ballast into the naval yard at Kingston at a full remunerating price, to the extent of £13,000 sterling."[19]

Estimates of value of the estate,

That the Commissioners showed only the bright side of the shield is apparent when the estimates of value of the estate and profits earned by the works are examined. The following statements possesses historic as well as economic interest :"[20]

[19] Report, p. 239.—Reference to this contract is made in the Order in Council of 30th October, 1821, (p. 15 ante). In those days pig iron was largely used as ballast for ships of war, for which purpose it was cast into lengths of about three feet, with a hole at each end through which a cable was slipped to make a connected but easily shifted weight. This explains the item of £38 for wages paid to the ballast moulder in the foregoing statement. Since the era of steam navigation coal is the principal article used for ballast in war ships.

[20] Report, p. 242.—The following detailed description of the works is given in the report of the Commissioners : "The works, of which a ground view with references is herewith presented, consists of two furnaces for smelting iron ore, connected by a casting house common to both, with the wheel house and bellows house attached to each, having in the same file of building several capacious rooms and lofts, usefully occupied in the purposes of a foundry —the whole forming one solid mass of building of limestone, constructed on the face of a bank of the same material, forty feet high to the level of the bank ; on this bank (an area of five acres of which is enclosed with a dry wall) three substantially framed coal houses are built, sufficient to contain each 35,000 bushels of coal ; another portion of the same bank has hitherto been occupied as a coal and ore bank, where the ore has been usually roasted on log heaps, to free it by that process from the intermixed sulphur, and upon the unoccupied part of it much if not all the charcoal required for the uses of the furnaces could be most profitably made, as will be hereafter shown. The furnaces, as conducted formerly by private enterprise, were found capable of making four tons of iron daily, on the average ; statements in which respect they are enabled to submit by politeness of the Honourable Peter McGill, the proprietor. In connection with the furnaces is a large and substantial stone building, containing two trip

ESTIMATE OF THE PRESENT VALUE OF THE ESTATE IN THE MARMORA IRON WORKS.

	£.	s.	d.
The new furnace, being the largest, is considered to have cost in its construction, with the two apartments attached, and the complete top-house, bellows-house and wheel-house	1,000	0	0
The bellows, bellows gear, wheel and shaft cost	250	0	0
The castings-house for both furnaces cost	400	0	0
The old furnace, wheel, bellows, bellows-house, wheel-house, top-house and sparking-room, in the ratio of the other furnace	1,000	0	0
The forge-house, with four fires, two trip-hammers, containing four sets bellows impelled by water from four different wheels, and the two hammers—two different wheels—original cost upwards of £2,500; present value at the lowest estimate	2,000	0	0
Carpenter's shop, complete	150	0	0
Four coal houses, at £30 each	120	0	0
Grist mill, one run of stone, complete, and smut machine	500	0	0
Saw mill, two pit and one circular saws, complete	300	0	0
Bark mill and tannery	200	0	0
Dwelling house	300	0	0
Stone boarding house	200	0	0
New store and office	300	0	0
Rake house, old office and old store	50	0	0
The clerk's house	180	0	0
Twelve dwelling houses for men, at £60	720	0	0
Barn, stable, root house, cattle shed, ash house as a dry house, ashes, etc	150	0	0
Water lot in Belleville, value	100	0	0
14,000 acres of land, at 20s. per acre	14,000	0	0
Utensils, etc., and lower store, patterns, etc., fire engine	300	0	0
Length of flume and canal	750	0	0
The two dams and breakwater as they now stand	500	0	0
Stock of ore	300	0	0
	£23,770	0	0

The quantity of land belonging to the works was only 12,735 acres, not 14,000, and the total estimate for the property should therefore be reduced by £1,265, leaving it £22,505 or nearly £2,500 less than the price set upon it by the owner. With plant and property of this value the Commissioners made the following estimate of profits on a year's business based upon the

and profits of the business.

hammers and four forge fires, for the purpose of making bar iron, with two wheels which trip the hammers, and four wheels that propel the bellows, one to each fire. This factory, put in active and kept in constant operation, is capable of making five tons of bar iron per week of all sizes and descriptions, and is now in a state requiring but moderate repair to fit it for immediate use.

"On the forge bank, a clear area of two acres, is another well built coal house, of equal size with those belonging to the furnaces; attached to the forges is a convenient carpenter's shop, sufficiently capacious to accommodate five workmen, with a lathe and grinding stone impelled by water, the upper loft of this shop forming a convenient and spacious moulding and framing room for moulding, planning and putting together large patterns and moulds; opposite and at a convenient distance between the furnaces and forges stands the general pattern store, and occupied besides as a casting and bar iron sale and deposit store, a good frame building, built on a solid foundation on the water's edge.

"Next on the falls occur in their order the blacksmith's forge, suited for two smiths, with benches and utensils complete; a bakery, the baker and miller's house, adjacent to a respectable grist mill, the under story of stone, the upper handsome, substantial, well-finished frame-work, one run of stone and a smut machine; contiguous to which is a superior saw-mill, newly built, with two pit saws and a circular saw; and near thereto on a small island, a situation admirably adapted for the purpose, is a substantial two-story building—under story stone, the upper story frame work, fitted into a most complete tannery, with vats, utensils and bark mill complete; added to these are several very valuable dwelling houses, some of them stone—a stone store and offices—a barn, barnyard and sheds, forming in the view of the Commissioners a more complete and substantial establishment than on its scale of magnitude can be met with in all North America." pp. 236-7.

working of the new furnace for a campaign of five months, allowing each furnace to continue in blast only six months of the year.[21]

	£.	s.	d.
Semi-annual profits of the new furnace	4,029	16	10
do do old furnace	2,442	10	10
Profits on sales of merchandise, provisions, etc., per annum	1,050	0	0
Profits on 156 tons bar iron	1,423	10	0
And that valued upon the farm	200	0	0
Total yearly revenue	9,145	17	8

The first of these items is calculated upon 328 and the second upon 225 tons of pig iron converted into castings, at £20 per ton. But the particulars are not very satisfactory. They afford good ground for criticism, and it may be presumed that the Government of the day was not dazzled with a prospect of making 36 per cent. profit on an investment of $100,000, or even 40 per cent. on $95,000, the Commissioners' valuation of the property and works.[22]

One member of the Commission (Isaac Fraser of Ernestown), who presented a minority report, appears, while persuaded of the value of the plant and the importance of the industry, to have seriously doubted the wisdom of the Government's engaging in the business.

Reasons against Government undertaking the business with convict labor.

"Without offering an opinion on the present value of the establishment," he stated, "the undersigned is fully persuaded that it possesses very great facilities and advantages for the extensive manufacture of iron, and that a more eligible situation for that purpose cannot be selected in this Province; but whether the manufacturing of iron on the public account and at the public cost, in preference to leaving that, as well as all other branches of industry, open to the free competition, skill, enterprise and capital of such individuals or companies as may wish to engage in the same, will be for the Legislature in its wisdom to decide. The principal object in transferring the penitentiary from Kingston to Marmora would seem to be the employment of convict labour, so as not to interfere with the pursuits of the honest mechanics of the Province; but if this object can be equally well attained at the present establishment, it is evident that the loss of the large amount already expended on it will be avoided, and the necessity of a further large outlay would be prevented."[23]

These views, and the representations of the warden of the penitentiary on the difficulty of maintaining discipline over the convicts, the necessity which would arise for employment of extra keepers to prevent their escape, the unsuitability of men with constitutions impaired and destroyed by intemperance and other excesses for hard labor, and the greater cost of maintaining a penal institution, whose inmates would be thus employed in an isolated location,[24] appear to have convinced the Government that the project could not be carried out.

VanNorman's venture at Marmora.

Nothing further seems to have been done with the Marmora works until 1847, when the property was purchased by Joseph VanNorman, of the Charlotteville furnace, for $21,000. Mr. VanNorman spent a large sum in repairing and improving the works, and began making iron in the summer of the following year. But he had no skill in treating hard magnetic ores, and all his efforts were attended with disappointment and loss. Shipments of

[21] Report, p. 247.

[22] One of the Commissioners who signed this report was Anthony Manahan, a charter director of the Marmora Foundery Company. George N. Ridley was the other.

[23] Report, p. 249. [24] Ib. p. 255.

product were made at first over a rough waggon road to Belleville, a distance of thirty-two miles ; but by cutting nine miles of road from the mine at Crow lake to Healy's falls on the Trent river a new land and water route was obtained whereby, although bulk was broken three times, pig iron could be delivered at Cobourg more easily and at less cost than at Belleville. Sales were made for a short time at $30 to $35 per ton ; but after the construction of the St. Lawrence canals British iron could be brought up the country and sold at a much lower rate, and Mr. VanNorman was compelled to close his works with the loss of everything.

A new company organized, and a large fuel reserve acquired.

In July, 1849, Mr. McGill conveyed the lands at Marmora which he had acquired from Mr. Hetherington in 1834 to the Marmora Foundery Company, and in 1853 this company was reconstructed under an amending charter and a capital of £80,000 stg. "to carry on extensively the manufacture of iron and steel." Among the new directors were A. T. Galt, Peter McGill, Alexander Simpson, William C. Evans and James B. Greenshields of Montreal ; William Rhodes and Edward Burstall of Quebec ; Robert Gillespie of London, and W. A. Matthews, mayor of Sheffield, Eng., and it was provided that the Act should not go into operation until £30,000 was paid in. Little is known of the affairs of this company until 1856, when it applied to purchase at a reduced price 20,000 acres of land as a fuel reserve. The matter was brought to the attention of the Legislature in the session of 1857, and the following resolution was adopted :

"That it is expedient to encourage the manufacture and production of iron in this Province, and for that purpose to allow the Marmora Iron Company to purchase for a fuel reserve waste lands of the Crown in the townships of Marmora, Belmont and Lake not exceeding 20,000 acres at the price of not less than one shilling and sixpence currency per acre."[25]

Amalgamation with the Cobourg and Peterborough Railway Co.

An Order in Council of 20th October, 1857, authorised the Commissioner of Crown Lands to carry out the sale to the company at thirty cents per acre, although the price of public lands in the Province at that time, as fixed by regulation, was eighty cents per acre. Patents for 15,000 acres of this purchase were issued in 1863, and for 4,800 acres in 1872 ; but in the meantime the company had become amalgamated with the Cobourg and Peterborough Railway Company, under the title of the Cobourg, Peterborough and Marmora Railway and Mining Company. The deed of amalgamation between the two companies was signed December 28, 1866, and in the following year mining operations were resumed at Big Ore bed[26] and shipments of ore began to be made to Cleveland and Pittsburgh *via* Cobourg. A section of railway, eight miles long, was built from the mine to the Narrows on the Trent river, whence the ore was taken by boat to Harwood station on Rice lake, and again put on cars for Cobourg. The shipping season did not last more than four months of a year, owing to difficulties of river navigation, and during this period about 100 tons per day were moved from the mine The books of the company are destroyed, but there are records to show that 12,205 tons were shipped in 1870, and 10,100 tons in 1873, the last year in which the mine was worked. None of the ore raised by the new company was smelted in the Province, and of course the timber reserve of 20,000 acres acquired from the Government was not used for the purpose for which it was intended. Some time before closing down the mine the company had bonded the whole of its property for $300,000. In 1883 the whole property, including railways and rolling stock, mines, furnaces and works, dwellings at Blairton and Marmora and about 30,000 acres of land, were offered for sale by direction of the court, and Mr. T. P. Pearce of Cobourg (now of Toronto) became the

Mining operations resumed.

The property sold by order of the court.

[25] Journals, 1857, vol. xv. p. 438.

[26] The name of Big Ore bed was changed by the new company to Blairton mine, and forty cottages were built for housing the employés.

purchaser, at the nominal price of $32,200. Mr. Pearce is still the owner, but the Big Ore bed at Blairton is filled with water, and the furnaces and works at Marmora are tumbling into ruins.

A Blast Furnace at Madoc.

Another unsuccessful venture in Hastings.

A furnace for smelting iron ore with charcoal fuel was built at the village of Madoc in 1836 or 1837 by Uriah Seymour, and was worked with varying success for eight or nine years. The mine which supplied this furnace with ore is known as the Seymour mine, and is on lot 11 of the fifth concession of Madoc. Mr. F. E. Seymour, son of the furnace owner, gave the following account of the enterprise to the Commissioners appointed to enquire into and report upon the mineral resources of the Province:

"My father had a foundry as well as the furnace, and they began the manufacture of those articles at once. There were several tests or experiments made with the ore, as it required different treatment to that of ores he had been accustomed to in York State; it contained neither phosphorus nor sulphur. I think smelting went on till 1844 or 1845. The experiments were very expensive, but I think the real cause of the stoppage was a lawsuit, together with a sudden drop in the price of iron. My father produced very good metal, and he said it was a very good ore to work when he got the proper flux. He mixed no other ore with it at all, but put loam with the flux, and this he considered to be the secret of his success."[27]

A fuller account of the difficulties experienced in working this furnace has been given by Mr. Thomas Macfarlane in the report of the Geological Survey, from information which the writer obtained from Mr. Seymour himself.

A record of furnace experiments.

"Limestone was used as a flux, and three different blasts were started with different materials (found in the neighborhood) for hearthstones. In each of these three trials the hearthstone was rapidly cut out by the slag, the furnace became unworkable and was blown out, always at a great expense for repairing the furnace and for fuel in heating it up. Mr. Seymour, supposing the bad quality of the hearthstones to be the cause of these misfortunes, procured a new hearth from Rossie, in New York, of the material used in the furnaces there. The furnace was again started, but, by way of precaution, with a blast at only one tuyere. The same flux was used as formerly, and the same slag was produced, cutting into the Rossie stone as much as it had ever done into the hearthstones previously used. It having been thus demonstrated that the former hearthstones were not at fault, since even the Rossie stone could not withstand the slag, Mr. Seymour decided to alter the flux, substituting for the limestone a sandy clay. This was done, the blast was stopped at the damaged tuyere, and introduced at the one which had been kept unused. Very soon the character of the slag changed. It became mild, did not cut into the hearthstone, and kept fluid and in motion long after it left the furnace. The iron was of excellent quality, but at this time the stock of charcoal became exhausted, it being impossible to procure charcoal burners to keep up the supply. Reduced to extremity, Mr. Seymour caused cordwood to be sawed up into lengths of two feet and used instead of charcoal. For seventy-five days he continued to work his furnace with the same fuel; and with only one tuyere, producing a good slag and excellent iron to the extent of one ton daily. About eighty tons were produced in all during the blast and cast into stoves, potash-kettles, etc., besides a small quantity of pig iron. The latter found a ready sale in Belleville at $27 per ton and was considered of first-rate quality for machinery. Encouraged by his success in smelting with wood, Mr. Seymour repaired the furnace and started it again with wood alone as fuel, and with the two tuyeres at work. From two to two and a half tons of iron were produced daily, but it was of an inferior quality: the

[27] Report of the Commission, p. 389.

castings made with it cracked in cooling. Mr. Seymour was led to suspect that this was caused by the wood descending too quickly and insufficiently charged into the furnace. That this did affect the quality of the iron was proved by stopping one of the tuyeres. The daily produce sank to one and one-quarter tons, but the good quality of the iron was restored, and the furnace kept in blast three months. The exact cost of the operation I could not ascertain, but Mr. Seymour assured me that according to his books this blast contributed somewhat to improve the financial position of the concern. The daily product of iron was however too small, and smelting with charcoal was again resumed, in the midst of which Mr. Seymour's partner was killed by an explosion in the mine. The difficulty of settling with his heirs became superadded to the financial difficulties of the concern, and Mr. Seymour's means having become exhausted he was obliged to suspend smelting operations."[28]

The failure of Mr. Seymour's venture does not appear to have been due to the quality of the ore, but rather to the primitive methods employed and to lack of sufficient capital where costly experiments had to be carried on with an ore the nature of which was not perfectly understood. The use of earth instead of limestone for flux seems to have been attended with very satisfactory results, a knowledge of which may prove to be valuable in the future treatment of our dense magnetic ores. From data furnished by Mr. Seymour to Mr. McFarlane it appears that he was able, even by the methods he employed, to produce pig iron with cordwood as fuel at a cost of $12 per ton.

Blast Furnace in Essex County.

Smelting bog ore in Essex county.

A furnace to smelt bog ore was erected in 1831 by Messrs. Cahoon & Field at what is now known as the hamlet of Olinda, in the township of Gosfield. A passing reference to this enterprise is made in Smith's Canada, where it is stated that ore was found in the townships of Colchester and Gosfield, "large quantities of which used formerly to be manufactured at the furnace in Gosfield."[29] But this furnace is little more than a tradition even in the locality where it stood, and the few notes given here have been gathered from the old residents. The height of the stack was about thirty feet and the furnace is said to have been driven by a cold blast through one tuyere, but its daily capacity is not known. Sufficient quantities of ore were obtained within a radius of five miles, being chiefly of a variety known as "shot" ore, and it was smelted with a mixture of hardwood and charcoal. Stoves, plows, potash kettles, etc., for the needs of settlers were made at a foundry in connection with the furnace, but the principal market for the pig iron was found in the United States. There are no records to show what quantity of iron was produced by this furnace, nor the price at which the pig iron was sold. After having been in operation six years it was blown cut in 1838, tradition says, "for want of funds."[30]

Experience of iron making in Quebec.

More than the lifetime of a generation has passed since the last pig iron was made in Ontario. Quebec has had a more fortunate experience, and a lesson of instruction to us may be found in it. I purpose therefore to follow the story of iron making in Ontario with some account of the production of pig iron from bog ores as carried on at the two seats of the industry

[28] Report of the Geological Survey, 1866, pp. 109-111.

[29] Smith's Canada, vol. i. p. 27.

[30] For the information about the Olinda furnace here given I am indebted to Mr. Grove Whaley, a farmer in the township of Gosfield. "My father, Mr. Henry Whaley, now deceased," Mr. W. writes, "was foreman during its existence. I am too young to remember anything concerning it, being only fifty-five years of age. But I have interviewed some of the old residents here who are supposed to know, and am sending you what facts I can gather."

in Quebec, in the valleys of the St. Maurice and St. Francis rivers. During the months of August and September of last year I visited the works at Radnor and Drummondville, and in February of this year I made again a hurried visit to Radnor along with members of the International Mining Convention. My information therefore has been obtained at first hand from the managers and officers of the works and from observations on the ground.

The St. Maurice Forges.

Furnace at St. Maurice village.

The group of furnaces known generally as the St. Maurice forges, from their situation on and near the river of that name, are five in number, and are in the counties of St. Maurice and Champlain. The oldest of these is at St. Maurice village, and has the name of being the second blast furnace on this continent, having been erected not later than 1737, and possibly four years earlier. The first furnace in America was built some years before this time by Governor Spotswood of Virginia, an interesting account of which is given by W. N. Adams in a recent number of the New York Iron Age,[31] who in November of last year exhumed it from the mass of debris, soil and vegetation which had buried it from human sight for one hundred and fifty years. The St. Maurice furnace, after an eventful history of nearly a century and a half, was blown out in 1883, having for the last twenty years of its existence been worked by John McDougall and his son George, and by the firm of John McDougall & Co. of Montreal. When John McDougall purchased the works in 1863 they consisted of one blast furnace and two Catalan forges. The hearth of the furnace was three feet square and four feet high, the diameter at the bosh was 8 feet 2 inches, and the height of the stack from the bosh to the throat was 20 feet. At first it was driven with a cold blast, but in the later years by a warm blast. The ore and charcoal were obtained in the immediate neighborhood, and about four tons of pig iron was produced daily. For three or four years the pig metal was cast into stoves, kettles, etc , but after 1866 the whole product of the furnace was sold to and used by John McDougall & Co. of Montreal for car wheels.[32] In 1874 the works were purchased by John McDougall & Co., and were carried on for about ten years longer, when the furnace was blown out for the last time owing to the scarcity of ore and fuel in the locality. The Catalan forges had been worked by John McDougall only two or three years. Their product was used in the manufacture of axes at St. Maurice, and of scythes at an establishment in Ontario.

Batiscan, L'Islet and Shawenegan furnaces.

Three of the other furnaces in the St. Maurice valley were the Batiscan, on Batiscan river, built in 1798, the L'Islet, and the Shawenegan, all of which are now idle. The Shawenegan furnace was a venture to smelt lean ores containing 10 per cent. of titanium, and was a complete failure. The L'Islet furnace was built by John McDougall at a distance of four miles from the old St. Maurice works. It also turned out a failure, as without railway facilities supplies of ore could only be got within the limits of carting distance, and after a few years the local fields were exhausted. Besides, the cost of carting pig iron to the market at Three Rivers left no profit to the producer.

The Furnace at Radnor Forges.

Furnace at Radnor.

The furnace at Radnor Forges is situated on the river Au Lard, distant fifteen miles from Three Rivers. The pioneer of the industry at this place was Mr. Larue, an intelligent and enterprising French-Canadian, who conducted the business against heavy odds for several years. The works were commenced in 1860, and when completed the plant embraced a blast furnace with a capacity of

[31] New York Iron Age, April 13th, 1893, p. 843.

[32] The head of this firm, it may be remarked, is not the John McDougall of St. Maurice, nor even a relative of that gentleman.

from three to four tons per day, rolling mills, a foundry for casting stove plates, car wheels, etc., and a factory for horseshoe nails, part of which was located at Three Rivers. The township was largely bushland, and roads had to be cut and made over which to bring in material for construction, supplies of fuel, ores, etc., and to carry out the products of the works, the nearest marketing and distributing point being at Three Rivers on the St. Lawrence. Under such circumstances it is little wonder that Mr. Larue's enterprise failed. His estate passed into the hands of G. B. Hall & Co., who undertook to carry on the works as a side business with lumbering. This firm retained possession until July, 1889, when Drummond, McCall & Co. of Montreal became the purchasers, and organized the Canada Iron Furnace Company with an authorized capital of $300,000. The property consists of the furnace and charcoal works with 80 acres of land at Radnor, a car-wheel foundry at Three Rivers, mining rights on about 100,000 acres of land (embracing the township of Radnor) which had been granted to Hall & Co. by the Local Government, and an extensive tract of timber land along the St. Maurice river above Grand Piles. The furnace was leased for a short time to George McDougall, and operations were carried on until May, 1891, when it was blown out and dismantled, and the erection of a new furnace was commenced under the management of Mr. John J. Drummond, with designs prepared by John Birkinbine of Philadelphia, president of the American Institute of Mining Engineers. The shell of this furnace is constructed of boiler-plate, with a diameter of 13 feet 6 inches from the mantle ring to the top. The total height from the hearth floor is 40 feet, the crucible has a diameter of 5 feet and height of 4 feet 8 inches, the bosh a diameter of 9 feet and height of 8 feet 4 inches, and the stack proper a height of 27 feet with diameter of 9 feet at the bosh and 6 feet at the top. The furnace is water-jacketed from the base of the crucible up to the bosh-line, the jacket consisting of sixteen sections of cast-iron plate about $2\frac{1}{4}$ inches in thickness, through which runs a coil of one-inch pipe, the plate having been cast around the coil in the mould. Half a million gallons of water flows through these pipes every twenty-four hours, whereby the temperature of the interior fire-brick wall is kept down and its life preserved. The tuyeres, four in number and $3\frac{1}{2}$ inches diameter, are water-jacketed also, and the hot-blast is driven into the furnace with a pressure of $3\frac{3}{4}$ lb., at a temperature of 850° F. So equipped the furnace had a capacity of 25 tons of pig per day of 24 hours. With a new Weimer blowing engine and four boilers now set up and working it is believed that the furnace can be driven up to 50 tons per day, but owing to a short supply of charcoal fuel the daily output during the winter has been limited to 25 tons. In practice the make will probably not exceed 40 tons per day. Gas from the stack furnishes fuel for the boilers and hot blast stove, and the supply will doubtless be ample when the furnace is driven to its full capacity.

A modern furnace built by the Canada Iron Furnace Company.

The blast was started in the new furnace on 12th March, 1892, and it is hoped that the campaign can be carried on for two years before closing down for repairs. For the first twelve months 6,500 long tons of pig iron was produced, the quality of which is claimed to equal the famous Salisbury brand.[33]

The ore supply for the Radnor furnace is procured from a number of sources on both sides of the St. Lawrence, and consists almost wholly of bog ore or brown hematite. Magnetic ore from the Bristol mine on the Ottawa

Supplies of bog ore.

[33] The St. Thomas Car Wheel Co. is now using 2,000 tons of Radnor pig iron a year. They volunteer the testimony that it is giving most satisfactory results in their car wheel mixture. "We have found that by the aid of it we can entirely dispense with the high-priced irons which we were formerly obliged to import, our records of tests showing an improvement of over 25 per cent. on the results previous to using your iron, in addition to which our percentage of loss has been greatly reduced." The Waterous Engine Works Co., of Brantford, report after two years trial that for cylinder and valve castings for engines it is at least equal to if not better than Salisbury iron, which they had previously used for this purpose.

river is used as a mixture in small quantities, but it contains sulphur and requires to be roasted. Farmers are employed during the slack season in raising ores on their own or the company's lands and either drawing it to the furnace or delivering it at the nearest railway station. A large quantity is raised by the company's employés at Lac-a-la-Tortue on the line of the Grand Piles railway, nine miles from Radnor, where after being dredged and washed it is loaded on cars and taken to the furnace. This lake has been worked for thirty-one years, and although it only covers an area of five square miles the supply is believed to be still very large. In places the ore lies two feet in thickness, and where streams enter constant addition is being made to the deposit, the particles of iron being washed out of the sand area southward of the Laurentian hills. The following analyses of bog ores used at the furnace have been made by Prof. J. T. Donald of Montreal:

——	1	2	3
Metallic iron	49.03	42.52	50.49
Manganese	1.78	1.18	0.23
Alumina	2.50	2.59	
Lime	0.32	3.47	
Silica	7.84	13.94	3.53
Phosphorus	.33	.302	.566
Sulphur	.09	.078	.15

The ore is very fine, yet it smelts freely and little of it is lost by blowing; but possibly the loss will be greater when the furnace is worked under higher pressure.

Production of charcoal fuel.

Charcoal is made partly at the works and partly at Grand Piles in kilns of rectangular and bee-hive forms, the latter being preferred. In the furnace yard there are eight rectangular and three bee-hive kilns, each having a holding capacity of 55 cords. At the Piles there are ten kilns, and five others are to be added. The supply of fuel there is practically inexhaustible, as the territory lies 70 miles along the St. Maurice river above the falls, and the Company has a right of cutting four or five miles back on either side. There are no obstructions on this stretch of the river, and the wood may be taken down in boats to the kilns at very low cost. About thirty per cent. of the coal is made from soft wood and seventy per cent. from hard wood, chiefly black birch and maple. The weight averages 22½ lb. per bushel and 110 bushels are required to smelt a gross ton, or say 98 bushels for a net ton of 2,000 lb. Much difficulty has been experienced in procuring help for the charcoal woods, owing to the exodus from that part of Quebec, and the company has a standing advertisement in the papers for a hundred men. Late last year twenty-five men were brought out from the charcoal-making districts of Sweden, and an effort is being made to bring out a hundred more this year. The Swedes have adopted a method of charcoal-making employed in their own country which may possibly lead to an important change in the company's fuel works. The timber is cut into lengths of ten feet, and after being rolled into heaps in the woods it is covered with earth and charred in the old-fashioned way. Constant additions however are made to the heap at one end, while from the other the finished charcoal is drawn out and carted off to the railway station or to a landing on the river. If this plan is found to be satisfactory it may supersede the kilns, but the company will no doubt be guided in its course by the results of careful comparison.

Means for preserving the fuel supply.

It has been stated that the company's fuel supply on the St. Maurice is inexhaustible; yet it is not proposed to deal recklessly with that heritage. On the contrary, the intention is to take no tree for charcoal-making under

12 inches diameter, and all parts of it down to three inches will be utilized,—and to lessen the risk of forest fires the smaller branches and brushwood will be gathered into heaps and burnt in the spring or early summer of each year. By pursuing this plan it is confidently hoped that a continuity of fuel supply will be preserved upon a limited area along the river, and that there need be no fear of increase of cost on account of long haulage for many years.

Labor employed at the works.

The Radnor furnace gives employment to a large number of men, some steadily but most of them irregularly, as they are farmers who employ their spare time in raising ore or cutting wood upon their own lands and drawing it to the company's works or the nearest railway station. Sometimes the total reaches 850. The average of the past year was 600, but some of these were employed opening up new fields of ore and on work of a preparatory character, so that in proportion to the production of the furnace the number was larger than will be found necessary hereafter. But with the increased capacity of the furnace a large force will be required, especially in the ore fields and in the woods. The wages of ordinary laborers range from 80 cents to $1 per day, of furnace laborers from $1.15 to $1.40 per day, and of furnace men from $75 to $100 per month.

The St. Francis Furnaces.

In the St. Francis valley, on the south side of the St. Lawrence, iron-making has been in progress for nearly a quarter of a century.

Locations of furnaces.

The first blast furnace in this district was built in 1869 on the Aux Vaches river, a tributary of the St. Francis, in the county of Yamaska. It was operated by the St. Francis River Mining Company for four years, during which 5,520 tons of pig iron was smelted from the bog ores in the locality, and in 1873 it was sold to John McDougall & Co. of Montreal. By this firm the works were carried on until 1880, when, upon the ores becoming exhausted, the furnace was dismantled.

In 1880 the same firm began to establish smelting works at the town of Drummondville, on the St. Francis river. One furnace, known as the Grantham, was built in that year, and a second, known as the St. Francis, in 1881. Both stacks are built of stone lined with fire brick, on four arches which form a square of 26 feet, and both are about 35 feet high. The bosh of the Grantham is 10 feet in diameter and that of the St. Francis 9 feet, the capacity of the former being 7 tons and of the latter 6 tons per day. Both furnaces utilize gas from the stack to heat the blast, the temperature of which is 400° to 450° F. The blowing cylinders are driven by a Leffel wheel of 56 inches diameter, and the pressure ranges from three-quarters to one pound per square inch. The blast is driven into each furnace through five tuyeres of 1½ inch diameter.

Supply of bog ore.

Bog ore is obtained from the districts south and east of Drummondville, at distances ranging from four to twelve miles. The bulk of it is raised by the firm's employés, washed by seiving in shallow wells, and drawn to the yard by the firm's own teams; but considerable quantities are gathered and delivered by farmers and jobbers. As washed this ore will analyze 50 per cent. of metallic iron, and yields in the furnace 40 to 42 per cent. When drawn by teams direct to the furnace it costs $1 per 1,000 lb., and when brought in by rail $1.25. Farmers on whose land the ore is mined are paid by the firm a royalty of 7½ cents per 1,000 lb., or 15 cents per short ton, which is equivalent to about 38 cents per ton of pig. The ore occurs in beds ranging from 3 to 12 inches in thickness, and sometimes to 20 inches. It is found in the sand or on the edges of bogs, on islands in the bogs, and occasionally in peaty deposits.

Charcoal fuel.

The charcoal for fuel is made in rectangular kilns on the furnace grounds from balsam, spruce and small quantities of white birch and soft maple, at a cost of about five cents per bushel. Wood for the purpose is delivered at

$1.25 per cord of 138 cubic feet, this being the French measure. Twenty-five bushels of coal is sufficient to smelt 650 to 700 lb. of ore, which is the usual charge for the furnaces.

The average length of a campaign is about ten months, at the end of which time it is found that the lining of the furnaces is in need of repairs; but both furnaces are hardly ever shut down at the same time. The whole output is used in the manufacture of car wheels at the company's works at Montreal, where it is regarded as equal to the production of the Salisbury furnaces. Sometimes large stocks accumulate, the quantity of which is determined by the requirements of the car wheel foundry. At the time of my visit in September about 2,500 tons of pig was piled up in the stock yard, although it might then be sold to dealers at $27 per ton.

Employment of labor.

With one furnace in blast 36 men are employed, and with the two 44 men. In the bush an average of 150 men is maintained for the year round, making ore, wood and limestone. The stone is obtained in the township of Grantham, about four miles from the furnaces, and 40 to 50 lb. is sufficient flux for a charge. The highest wage paid at the furnaces is $1 per day, and the average is 90 cents, which with a free house makes a round rate of $1. In the bush men taking out ore are paid $1 per day, and axemen are paid 50 cents per cord. In round numbers those two small furnaces at Drummondville give employment to 200 men, whose earnings in a year are $60,000.

The Bounty on Pig Iron.

Rate of the Government bounty.

With the object of encouraging the production of pig iron in Canada the Dominion Parliament ten years ago adopted the bounty system, and provision was made for the payment of $1.50 per ton of 2,000 lb. This bounty was continued until the end of the fiscal year 1888-89, when for the next three years it was reduced to $1 per ton. Beginning with 1st July, 1892, the rate was increased to $2 per ton, and payment of bounty at this rate has been authorized for a period of five years.

The following table gives the quantity of coke and charcoal pig iron made in the Dominion in each fiscal year since provision was made for payment of the bounty, and also the amount of bounty paid as shown by returns made to Parliament, the weight being expressed in tons of 2,000 lb.:

Year.	Coke Iron.		Charcoal Iron.		Total Pig Iron.		Bounty paid.
	tons.	lb.	tons.	lb.	tons.	lb.	$
1883-4	25,472	0399	3,855	1797	29,328	0196	44,089.91
1884-5	21,174	0166	4,595	1135	25,769	1301	38,654.91
1885-6	22,463	1426	3,715	1770	26,179	1196	39,269.56
1886-7	35,464	1520	7,255	1178	42,720	0698	64,081.41
1887-8	16,120	1888	4,646	0329	20,767	0217	31,151.58
1888-9	20,413	1200	4,404	1880	24,818	1080	37,233.27
1889-90	20,775	0048	2,594	0952	23,369	1000	25,697.27
1890-1	15,849	1632	4,303	0515	20,153	0147	20,153.05
1891-2	26,066	0528	4,228	0306	30,294	0834	30,294.37
1892-3 to Feb. 3.	24,678	0284	5,770	1870	30,458	2154	57,952.83
Totals	228,478	1091	45,370	1732	273,849	0823	388,578.16

Coke iron.

All the coke iron in the first nine years was produced at one furnace, that of the Londonderry Iron Co. of Nova Scotia; but since the opening of the present fiscal year another furnace has commenced to make coke iron in that Province, viz: the New Glasgow Iron and Coal Co., which has produced 6,130 tons, and has been paid a bounty of $12,260 thereon. The Londonderry Company on 222,348 tons has been paid in bounties $309,886. For the first nine years its average yearly make was 22,644 tons (or 62 tons per day), and

the average yearly bounty was $30,575. The statistics of those nine years do not afford evidence that production was encouraged by the bounty. In the last two years during which $1.50 per ton was paid the output was less than in the first two years under which the bounty was $1 per ton, while in the third year of the lower bounty the output was greater than in any except one of the preceding years. The present year promises a considerable increase, which may be due to the larger bounty now paid; but production will always be more influenced by the conditions of the market than by the rate of Government bounty.

Charcoal iron.

The charcoal iron is wholly the product of Quebec furnaces, viz: of the two at Drummondville and the one at Radnor Forges, the latter having made in the whole period 12,464 and the former 32,906 tons. During the first nine years the Radnor furnace produced 8,474 tons, upon which it received a bounty of $10,686: but its product to February 3rd of the current fiscal year, with the new furnace in blast, has been 3,990 tons, and the bounty paid has been $7,081. The Drummondville furnaces produced in the first nine years 31,126 tons, upon which a bounty of $44,762 was paid. The average yearly make of these Drummondville furnaces for the nine years was 3,458 tons, ranging from 2,070 tons in 1889-90 to 6,495 tons in 1886-7. It will also be noticed that the largest production of coke iron was in the last named year. Another charcoal furnace has been started in blast this year in Nova Scotia, but the table does not include any portion of its product

Ontario is a large consumer of the coke and charcoal irons made at those furnaces, and she imports large quantities from Great Britain and the States besides. But although she has great deposits of iron ores within her own borders, and extensive forests of timber suitable for the making of charcoal fuel, as well as much capital waiting for investment, she does not produce a ton of pig iron to supply her own large needs.

Advantages of Production in Ontario.

The bonus and the tariff duty.

The duty imposed by the Canadian tariff on pig iron is $4 per ton of 2,000 lb., and the bounty given by the Dominion Government to the owners of blast furnaces producing pig iron from native ores and with native fuel is $2 per ton. The Canadian ironmasters therefore enjoy an advantage in their own market over foreign competitors (in which of course the British ironmaster is included) of three-tenths of a cent per pound, or $6.72 per long ton, which is the rate of protection afforded by the United States tariff. In Quebec and Nova Scotia this is regarded as sufficient encouragement for the industry, and in the opinion of some practical men who know conditions in this country and who have a full knowledge of the cost of producing pig iron in the neighboring States, the charcoal iron industry would seem to require no further aid in this Province. We have abundance of hardwood timber suitable for making the finest quality of charcoal fuel; and in the same forests, convenient to lines of railway already built, we have extensive deposits of iron ores, several of which have been opened and could be worked again at little or no cost for machinery and development. But the cost of production varies so much at different furnaces that it would be impossible to say with certainty what that cost might be at any given point in Ontario. This can be determined only by actual practice; and so much depends on the skill of workmen, the business capacity of managers, the suitability of a furnace to do economic work, the cost of assembling ore, fuel and flux, and various other considerations, that it would be useless to enter upon a discussion of the question of cost in the abstract. Practical men will investigate for themselves. Past experience in this Province is of some value, but chiefly for the lessons which it affords of practices to be shunned. Lessons of more value may be gained from the experience of ironmasters in Quebec and Nova Scotia in our own country, and many more from the experience of iron-

Favorable conditions for producing charcoal iron in Ontario.

masters in the United States. It is not for the lack of capital that there are no blast furnaces here, but rather for lack of men with confidence and enterprise to invest their money in the business of iron-making as they do in other manufactures, in trade, or farm lands, or bank stocks, or corner lots. They have been educated to invest money along these lines, and they know that within certain limits they may do so securely. The time will come no doubt, if it has not already arrived, when men with capital will turn their attention to the great dormant resources which Ontario possesses in its belts and beds of iron ores and forests of hardwood timber, and some will be found with courage to venture their money in starting an industry. But before embarking in the enterprise they will satisfy themselves by enquiry that the conditions of success are favorable; and although there may be disappointments, the experience of the world proves that it is by such men industries are built up. Self-reliance is of infinitely greater value to a business man than the best devised scheme of Government bounty alone can be; and there are many who believe that the bounty on pig iron provided for by the Canadian Government, in connection with the measure of protection afforded by the tariff, is ample in its liberality. Australia at the present time is passing through a severe commercial crisis, and the Melbourne correspondent of the London Times, in writing of the situation to that paper, opens his letter with this observation: "In order to understand the present position of Victoria, you have but to remember," some one said to me the other day, "the habitual attitude of the native-born Australian, who, wherever he stands, must lean against a post." And the correspondent remarks that the more the financial situation of that country is studied the more profoundly true the observation will appear. The depression through which Victoria is passing, he says, is to be described in general terms as the outcome of leaning against posts instead of trusting to the natural power of standing upright and depending on one's own energy and resources. It is to be hoped that no comment of this sort will ever be necessary in describing the Ontario man; but if he is taught to rely on subsidies and bonuses instead of upon his own skill and enterprise, he also may come to possess that fatal weakness of the back which needs the support of a Government post. There are ways doubtless in which Government help can and should be given, the most natural and useful of which would appear to be the collecting and publishing of information on all the natural resources of the country, and on the best economic methods whereby raw material may be utilized and converted into finished article, to the mutual advantage of producer and consumer.

Need of self-reliance and enterprise.

Best form of Government help.

Diversity of production an element of commercial prosperity.

Thirty years ago the industries of Ontario were few in number, the main sources of wealth being the wheat and barley grown by the farmer in the frontier and the lumber and timber sawn and cut by the lumberman in the backwoods. Then the failure of a grain crop or an overstocking of the lumber and timber markets was a serious matter to the trade and commerce of the country; and in Australia today the situation is much the same, with wool-growing and mining as the chief industries. But now we have a diversity of industries; in agriculture alone the variety of products gives evidence of surprising development, and to this diversity we owe in very large measure our immunity from commercial and financial distress. To open up and work our deposits of iron ore, to build blast furnaces and smelt ore into iron, and to manufacture iron into the endless forms for which it is required in the service of man, would be to make an important and substantial addition to the diversity of our industries, and so to broaden the foundations of the country's prosperity. But no new enterprise ought to be undertaken rashly. "Make haste slowly," is a good maxim in every human undertaking. The gourd which came up in a night to shelter the head of an angry prophet, a worm smote it, and it perished in a night.

III.

THE IRON ORES OF ONTARIO.

Extent of the mineral-bearing formations in Ontario.

The Laurentian, Huronian and Cambrian formations constitute the whole northern portion of the Province from the Ottawa river to Lake-of-the-Woods, saving portions of the Moose river basin towards James bay, where there is an outcropping of the Devonian. They form the whole region from Lake-of-the-Woods to lake Superior, the northern and eastern shores of the latter lake as well as of lake Huron, and nearly the whole country thence eastward to the Ottawa river and southward across the Thousand Islands in the St. Lawrence to the Adirondack mountains in New York. These are the chief mineral-bearing formations of the earth's crust, and consist of talcose and other slates, quartz rock, gneiss, limestone, serpentine, granite, syenite and other subordinate masses. The limestones and serpentines yield marbles of beautiful descriptions, the felspathic rocks furnish good porcelain clays in their decomposition, copper and nickel ores are found in several localities, veins of gold ore occur in the county of Hastings, on Lake-of-the-Woods and at a number of intermediate places, silver in various localities in the Cambrian rocks, plumbago is abundantly developed, and the whole of the older series appears to be associated with large and valuable supplies of the magnetic and specular oxides of iron. "Specular and magnetic oxides of iron are disseminated in scales and grains, both in the gneiss and the limestone; but there are also important interstratified beds of these iron ores varying in thickness from a few feet up to several hundreds, those of the magnetic oxide being the thicker and more numerous. Some of the thickest of these beds are interstratified with layers of limestone, and as far as known most of them appear to be either associated with the great limestone bands, or to be not far removed from them in stratigraphical place."[1] "The magnetic oxide sometimes occurs in masses made up of coarse grains; at other times the ore is fine grained and almost compact; more rarely it occurs in regular octahedral crystals. This ore is found only in crystalline or metamorphic rocks; and the deposits of it in Canada occur in the Laurentian series, or in the crystalline rocks of the eastern palæozoic basin. In the former it is met with in beds of great extent and thickness."[2] Professor Emmons, in his final report on the geology of New York, mentions the existence in the district bordering on lake Champlain and the St. Lawrence of upwards of seventy veins and beds of these ores, ranging in thickness from two to one hundred and sixty feet, while two others are respectively five hundred and fourteen and seven hundred feet in thickness. One of these larger beds has been followed for two and a half miles, and the amount of ore which it contains may be seen when it is stated that in a mile every five feet in depth would yield about one million tons of pure iron. Valuable deposits of the same ores have been discovered in Ontario in the townships of Marmora, Madoc, Bedford, Bastard and other places, and when we reflect upon the great extent of the mineral-bearing formations here, in so many parts of which the magnet is deflected from its meridian, presumably by the proximity of magnetic ore, it is not unreasonable to hope that search may disclose great bodies of iron ore over wide areas of territory. In the northern peninsula of Michigan and in Minnesota, where the formations are the same as in sections of Ontario north of lake Huron and northwest of lake Superior,

Specular and magnetic oxides of iron.

[1] Geology of Canada, 1863, p. 26. [2] Ib. p. 673.

iron ores abound on a larger scale than anywhere else in the United States, and it can hardly be doubted that a thorough search on the Ontario side would result in the discovery of the same ores in equal abundance and richness.[3]

Logan's Report on Ores of the Ottawa Valley.

Ores in the Ottawa valley.

Among the minerals found associated with the formations of the Ottawa valley are the magnetic and specular oxides of iron, bog iron ore, brown ochre, galena, copper ore, plumbago, etc. In his report for 1845-6 Sir William Logan expressed the opinion that the great spread in the valley of the Ottawa of the metamorphic rocks with which the ores of iron seems to be so largely associated in other parts of its extension on both sides of the St. Lawrence makes it very probable that the banks of the Ottawa and its tributaries will

Hull mines.

be supplied with vast stores of them. In Hull, on the Quebec side of the river, a bed of the magnetic ore is met with for a distance of about one mile in syenitic gneiss, interstratified with white crystalline limestone holding mica and graphite, which varies from twenty to forty feet in thickness.[3] Where the ore has been acted on by the weather it breaks up into grains which, it is claimed, adds considerably to its value for smelting purposes Assuming the breadth of the vein to be twenty feet, Sir William Logan calculated that every fathom forward with a vertical depth of a fathom would probably yield not less than fifty to sixty tons of pure metal. An analysis of this ore made by Sterry Hunt gave 96.09 per cent. of magnetic oxide of iron (equal to 69.65 metallic iron) and 3.18 of silica and graphite. On the Ontario side of the

Deposits in Renfrew and Lanark.

river ores occur in the townships of Bedford, Bastard, Sherbrooke and McNab. The Sherbrooke bed occurs on the north shore of a beautiful sheet of deep water called Christie's (or Myers) lake, and is described as containing a mass of very great importance, the bed having a thickness of about sixty feet. An analysis by Sterry Hunt gave 87 per cent. magnetic oxide of iron (equal to 63 per cent. metallic iron) and 12.08 silica and mica mechanically mixed. On the south side of the lake a bed of twelve feet of magnetic iron occurs in

Specular ore in McNab.

gneiss. Specular ore exists in the township of McNab, on the west side of Chats lake, an expansion of the Ottawa, an exposure of which showed a thickness of twelve feet, and outcroppings have been traced a length of one mile. The ore presents a red, earthy aspect on the weathered surface, but in fresh fractures it has a purplish red hue, and exhibits an aggregation of minute shining scales. There are some impurities arising from the presence of small quantities of quartz and calcareous spar, but taking the breadth at twelve feet it is probable that the bed would yield not less than twenty-five tons of pure iron for every fathom forward with a fathom in depth. A specimen analysed by Hunt gave 84.10 peroxide of iron (equal to 58.87 per cent. metallic iron) 4 of silica, 8.80 carbonate of lime and 3.10 of water by loss. "The silica and carbonate of lime" Dr. Hunt added, "are accidental impurities, and are disseminated in little spots and veins. The ore is, when pure, a peroxide of iron only."[4]

Iron Ores at the first World's Fair.

Exhibit of Ontario iron ores at the first World's Fair,

At the World's Fair held in London in 1851 a number of specimens of iron ore from Canada were exhibited, most of which were collected by the

[3] Geological Survey of Canada, 1843, pp. 41-2. Canada possesses in the crystalline ores of the Laurentian rocks and in the iron slates of the Eastern Townships "inexhaustible supplies of rich ores of this precious metal which may compare with those of the United States or with Sweden. It is from these magnetite and red hematite ores, reduced by charcoal, that the finest iron of the world is manufactured; and it cannot be doubted that skilled labor and capital will one day make the iron mines of Canada great sources of national wealth." Geology of Canada, 1863, p. 687.

[3] According to the Geology of Canada, 1863, the thickness of this bed is ninety feet, p. 673.

[4] Geological Survey of Canada, 1845-6, pp. 75-8 and 122-3. Geology of Canada, 1863, pp. 673-4.

offic-rs of the Geological Survey.[5] This Province was represented by the following exhibits: Large blocks of magnetic ore from Marmora, Madoc, Bedford, South Crosby and South Sherbrooke, specimens of specular ore from the Wallace mine location, and a large block from the township of McNab. There were shown also samples of pig iron made from the ores of Belmont and Marmora by the Marmora Iron Company. Referring to the evidence which this collection gave of the vast supplies of iron with which the Province is enriched, Sir William Logan observed that it appeared to arrest the attention of all. The British miner who is accustomed to follow beds of ore of six inches and one foot in thickness containing 30 or 40 per cent. of iron naturally regarded with surprise great blocks of it from beds of 100 and 200 feet in thickness, yielding 60 to 70 per cent. of metallic iron; but the British smelter upon being informed that no mineral coal existed in the vicinity of the ore did not appear to apprehend that any competition would arise to interfere with the supply to Canada of those qualities of iron which are made in the United Kingdom from the deposits of the Carboniferous era. Some Sheffield manufacturers of steel, whose supply of iron was obtained from Sweden at prices varying from £10 to £33 per ton according to quality, seemed desirous of ascertaining the cost that would be required to smelt the magnetic oxide in Canada, and to them it was a question of the wages of labor rather than anything else, assuming the requisite skill to be introduced into the country, whether any competition could be established in favor of Canada, seeing that the ore and fuel in the two countries are the same. "The superiority of Swedish iron for steel is unquestionable; its character for such a purpose stands higher than that of any other country; it is made from the magnetic oxide, and between the magnetic oxides of Sweden and some of other countries chemical analysis instituted for the express purpose of comparison has, it is said, been unable to detect any difference. It might be supposed therefore that smelted with charcoal and generally treated in the same manner, there ought to be no essential difference in the quality of the iron. Experiment however does not prove this to be the case, and there may be some delicate difference (possibly the presence of rare metals in small quantities) which may yet have escaped the investigations of science, to account for the results. The ores selected for comparative trial may have been the produce of geological formations different from those of Sweden, but it is not likely that this can give the essential cause of difference, as even in Sweden the ores of different mines in the same geological formation, all yielding good steel iron, give differences of quality which are so uniform as to produce a regular and constant difference in price. The geological formations yielding the magnetic oxides of Canada and those of the United States, where they prevail in equal abundance, are identical, and it is probable they are both of the same formation as that of the Swedish mines. The practical experiments on Canadian ores are still so few that nothing can yet be proved from them. But in the United States the American smelter has been able to compete with the Swedish, only on this side of the Atlantic, and that with the assistance of a considerable protective duty." Referring to the general effect produced by the exhibit upon the minds of visitors, Sir William Logan remarked that the Canadian ores were examined with great care and attention by the agents of Russia, who were struck with wonder that such prodigious source could be found in any country but their own: while the public in general, without taking into consideration the question of present application to profitable uses, seemed to regard the great beds of magnetic oxide as national magazines in which was stored up a vast amount of a material indispensable to the comfort and progress of mankind, which it is always satisfactory to the inhabitants of a country to know is within their reach and control should circumstances arise to render its

and Sir William Logan's report thereon.

Superiority of Swedish iron.

Effect of the exhibit on European visitors.

[5] Geological Survey of Canada, 1851-2, p. 39.

application expedient or necessary. Referring particularly to the specimens of specular ore from the township of McNab, Sir William reported that it was regarded as "a very beautiful ore, the uniform quality of which would render it one of much more easy fusion and management than the magnetic oxides, while it would probably produce an iron of excellent quality."[6]

ORES ON THE RIDEAU CANAL.

Specular ore Bastard.

It was about this time that Mr. Murray of the Geological Survey began to examine the country along the Rideau canal, and to report on occurrences of specular iron ore in the sandstones and conglomerates of the Potsdam formation in the ninth and tenth concessions of Bastard, where it extends over a considerable area in thin layers. Although no evidence was observed of the fact, Mr. Murray expressed the opinion that in some portion of the distribution the quantity of ore might be found to increase to a productive amount. "The concentration of the ore is greatest towards the middle of the bed, where nodules and patches of pure red hematite, running with the stratification, occur at intervals of a few inches, the thickness they display not exceeding a couple of inches. About forty years since an attempt was made to mine the ore for the supply of a furnace erected at Furnace Falls, but the quantity in the locality worked was not sufficient to give a profitable result. The Potsdam formation is similarly characterized on the twenty-third lot of the same concession of the township, and also on the ninth concession of Lansdowne, and the ferruginous deposit would thus seem to extend over a considerable area."[7] Mr. Murray goes on to say that in the state of New York an iron ore of this description occurring under similar circumstances in the same formation has been made economically available, and in those parts of the district under consideration in which a deep red color characterizes the formation it merits attention.

Magnetic ore in South Crosby.

In the adjoining township of South Crosby Mr. Murray found a large body of magnetic iron ore on an island in Mud lake, not far from Newboro on the Rideau canal, which is described as a mass of considerable purity running northeast and southwest, apparently with the stratification, and having a breadth of about seventy yards.[8] Referring to these locations six years later, Sir William Logan stated that 2,000 tons had been mined by Messrs. Chaffey of Kingston and exported to Pittsburgh by way of the Rideau canal and lake Ontario, the price on board of lake craft being $2.25 per ton. In 1854 the ore bed at Hull, on the Quebec side of the Ottawa river, was opened and mined by Messrs. Forsyth & Co., iron smelters of Pittsburgh, with the object of supplying ore to their own smelting works. It was transported from Hull through the Rideau canal to Kingston, and thence shipped by lake craft to Cleveland, but Sir William Logan remarks that as the Newboro bed was much nearer to Kingston and more favorably situated for loading into canal barges, the ore from it could be placed at the shipping port at a lower cost, the effect of which was that Forsyth & Co. began to take their supply from Messrs. Chaffey. During the season of 1859 the quantity of Newboro ore exported was 4,000 tons, making with the previous year's export 6,000 tons. "The trade in the ore," Sir William observed, "has naturally excited a keen search for other deposits in favorable positions, and Messrs. G. Chaffey and Brothers, who mine the South Crosby ore, have informed me that this search has been rewarded by the discovery of the continuation of the ore bed across the first and second lots of the sixth range of North Crosby. They have also informed me that a deposit of ore has been met with on Black

Iron ores on the Rideau canal mined and shipped to the United States.

6 Geological Survey of Canada, 1851-2, pp. 45-7.

7 Geological Survey of Canada, 1851-2, p. 81. The furnace here referred to is the one mentioned on p. 13 ante, the first blast furnace built in this Province.

8 Ib. p. 80.

lake in the eighth lot of the fourth range of Bedford, and another one on the sixth lot of the third range. These may be a continuation of the bed which has been described by Mr. Murray in a previous report as existing on the twenty-first lot of the ninth range of the same township."[9] In the Geology of Canada 1863 (p. 674) the ore of this mine is reported as forming a bed 200 feet thick, running northeast and southwest in gneiss, adjoining the crystalline limestone.

A bed of limonite or bog ore was observed by Mr. Murray on lot twenty-one in concession seven of Bastard, which was found to be about two feet thick in one place, and bounded on one side by an escarpment of rock. Dr. Hunt describes it as very pure in appearance, and an analysis showed it to contain 77.80 peroxide of iron, .061 of phosphoric acid, 16.5 water and the remainder of sand and alumina.[10]

Bog ore in Bastard.

Billings' Estimate of Quantity.

A remarkable paper bearing on the quantity of ore in some of the foregoing mines and properties appeared in the second volume of The Canadian Naturalist and Geologist by Mr. E. Billings, a gentleman who was for many years connected with the Geological Survey. Referring to the Hull mine on the Ottawa river, he described it as one hundred feet in thickness, instead of twenty feet as had been supposed by Sir William Logan, and stated upon the authority of Dr. Hunt that it contained about 70 per cent. of pure iron. The limits of the mine had not at that time been traced, but Mr. Billings had no doubt that this bed underlies the country for many miles in one continuous sheet. "It is not a vein filling up a perpendicular fissure in the earth's crust, but a bed lying between the strata of the formation. Where it is exposed it forms a dome and dips away in all directions. How far it extends cannot be ascertained, but granting that 500 fathoms is its limit each way, then it would contain 250,000,000 of tons of pure iron." This mine is situated five miles from the city of Ottawa, on the Quebec side of the river. Of the Crosby mine on the Rideau canal Mr. Billings said: "This bed is said to be nearly 200 feet thick, and should its yield be as great in proportion as that of the Hull mine, it would contain in a superficial area of 1,000 fathoms 500,000,000 of tons of pure iron. This enormous bulk of metal can scarcely be conprehended. Were the whole iron mining force of Great Britain and the United States at work for one hundred years upon such a deposit, they would not, at their present rate of production, exhaust it." Then as to the deposit in South Sherbrooke, he described it as a bed 60 feet in thickness, and estimated its probable contents at 100,000,000 tons of pure iron. Of the specular iron ore location in the township of McNab, he said: "The bed is twenty-five feet thick, and contains perhaps 50,000,000 of tons to the 1,000 fathoms square. It is situated about one mile from the village of Arnprior, thirty miles from the city of Ottawa, and in the midst of an abundance of water power." After noting that the beds from which the Marmora iron works were at that time supplied might be estimated as containing 100,000,000 tons, Mr. Billings proceeded to say: "We have therefore in the above five beds in round numbers 1,000,000,000 of tons—a quantity sufficient to yield 1,000 tons of iron a day for 3,000 years, could furnaces be erected and kept in operation capable of smelting that quantity. And as the deposits above-mentioned are only a part of the known iron wealth of the Province, and in all probability but a small proportion of that which is at present unknown, but must be brought to light as the Laurentian region becomes settled, it is clear that we may safely consider the stores of this metal inexhaustible."[11] Mr. Billings spoke with the

Estimates of iron in ore beds of the Ottawa valley and eastern Ontario.

Hull mine.

Crosby mine.

South Sherbrooke and McNab beds.

Marmora ores.

[9] Geological Survey of Canada, 1858, pp. 47-8.

[10] Geological Survey of Canada, 1851-2, pp. 82 and 105.

[11] The Canadian Naturalist and Geologist, vol. II. first series, pp. 23-4.

authority of an old officer of the Survey, and although his fame rests upon studies made in another department of the work of the Survey, viz., palæontology, it cannot be supposed that he made such explicit reference to the possible supply of ore in the localities mentioned without careful examination and inquiry. Yet in view of the pitiful results of mining operations at Hull and South Crosby, it may well be questioned if in respect to his estimates of quantity, description of quality and claim for economy of working, there is not an air of extravagance. One can hardly credit the possibility of the existence of the equivalent of 500,000,000 tons of pure iron on the line of the Rideau canal, which could be mined, loaded upon canal boats, delivered at Kingston and transferred to lake vessels for Cleveland or Oswego at $2.25 per ton, when iron ore was selling for $6 per ton at Pittsburgh, and yet such a mine to lapse into idleness. Even at present prices and in the face of a duty of 75 cents per ton, its working ought to yield a good margin of profit. I am not aware that Mr. Billings' estimates of the quantities of ore in these localities have ever been disputed. But we shall see farther on why the Chaffey mine failed to realize expectations.

The Hastings and Frontenac Districts.

The existence of iron ore in the districts north of Kingston, Belleville and Cobourg was known at an early period in the history of the country, and we have seen that as long ago as 1823 a blast furnace was erected in the township of Marmora to smelt ores taken from the Big Ore bed at Blairton. Frequent references to the occurrence of magnetic iron ores in those localities are made in the early reports of the Geological Survey, yet it was not until 1852 that the region was visited by an officer of the Survey. In that year Mr. Alexander Murray explored the country lying between the township of Bedford in Frontenac and the river Severn; the object being, as stated by Sir William Logan, to trace the general outcrop of the lower fossiliferous rocks along the more mountainous metamorphic group which comes from beneath them on the north, and to ascertain the nature of the economic materials associated with both at moderate distances from their junction. The following account of the occurrence of magnetic and specular iron ores in the region traversed by him is taken from Mr. Murray's report:

Report on the magnetic and specular ores of the region by Murray.

"Ores of iron are very generally disseminated through the rocks of the Laurentian group, and when existing in large workable masses appear to be usually either in contact with or at no great distance from the crystalline limestones. The localities where the magnetic oxide was chiefly met with were in Bedford, Madoc, Marmora, Belmont and Seymour; and although the information received by me from time to time makes it appear probable there must be many more places where it abounds, I did not see except in these townships any instance where the material was in sufficient quantity to warrant the experiment of working it. One of the localities visited was on the 21st lot of the ninth concession of Bedford, where the magnetic oxide occurs at the foot of a ridge of gneiss, associated with a greenish rock consisting of an aggregate of greenish felspar, and numerous large prismatic crystals of greenish hornblende in a pale fawn-colored calcareous base. The bed to which it belongs is not well exposed as it lies in a hollow, the greater portion of which at the time I was there was covered with growing grain; but its presence was indicated in the same position and associated with the same minerals by the fragments strewed upon the surface for about a quarter of a mile in a northeast direction from where it was first seen. To the westward there is a fault running north 25° west and south 25° east which throws the ridge of gneiss about 150 yards to the southeastward on the southwestward side; but although a careful search was made for the continuation of the ore, both in the direction of the dislocation and on the southwestward continuation of the ridge, it was nowhere found. The bed of ore did not appear to be over three

In Bedford.

or four feet thick. Immediately on the southeast of the ridge crystalline limestone comes in with its associated beds, dipping on the average northwest at an angle of 30°. Another exhibition of the ore occurs in Bedford, near the northeast end of Bob's lake, supposed to be in the twenty-fifth lot of the fifth concession. It was found in small fragments near the foot of a ridge of crystalline limestone, but nowhere in place, and is probably of no economic importance.[12]

"I was informed by an Indian that iron ore had been found a little way to the north of the portage, about half way between a place called the Beaver Dam and Cross lake in Olden, but although a whole day was expended in the search it was nowhere found, except in small specks or crystals in the felspathic rock of the country. In Olden.

"The deposits of iron ore in Madoc, Marmora and Belmont, some of which have long been known and have been worked will probably hereafter become of great commercial importance. The ore, which was formerly smelted at the village of Madoc by Messrs. Seymour & Co., and produced an excellent quality of iron, was mined on the eleventh lot of the fifth concession of the township. The bed appears to run through a black, soft, micaceous rock, and holds a course which, as far as it was traced, was about west by north and east by south, while the slope of the bed, which is towards the south, was between seventy-five and eighty degrees. The greatest observed breadth of the bed appeared to be about thirty feet, and its average would probably not fall short of about twenty feet. A material similar to the soft, black, micaceous rock, which accompanies the bed of ore on each side, appears every now and then to cut it diagonally in thin belts. In one place the bed is said to have been thus cut at distances of from every three to ten feet, and in another there was an unbroken part with a length of fifty feet. The ore is very black and very fine-grained, and while the whole body of it is magnetic, some portions of it have polarity, one end of a fragment repelling and the other attracting the north end of the magnet. When the ore is bruised with a hammer on these portions of the bed, or on fragments taken from them, the particles adhere to one another and stand up on the mass as they would on a magnet, the ore being, in short, a natural magnet or loadstone. The portions which have polarity appear to run across the ore-bed at right angles. Nodules of actinolite or green fibrous pyroxene, made up of radiating crystals, are disseminated in the ore, and yellow uranite is found investing small cracks. I was informed that in the general direction of the bed traces of ore have been met with twice to the eastward, in the tenth lot of the sixth and the ninth lot of the seventh concession, and to the westward in the twelfth lot of the fourth concession, the distance between the extreme points being about two miles. In Madoc, Marmora and Belmont. Loadstone.

"On the eighth lot of the first concession of Belmont is situated the bed of magnetic oxide which yields the ore formerly smelted at the Marmora iron works. It is commonly known as the Big Ore bed, and has usually been called a hundred feet thick; it appears however not to be a single bed, but a succession of them, interstratified with layers of greenish talcose slate and crystalline limestone, occupying a breadth across the strike and back from Crow lake, into which it obliquely runs, of about eight chains. The general strike of the strata appears to be about south 40° east, and the slope towards the northeastward from 25° to 50°. At one place, on a surface of greenish colored mica slates, underlying coarse disintegrating crystalline limestone, the dip was north 62° east at an angle of 50°; but Big Ore bed, or Blairton mine, in Belmont.

[12] "On the twenty-first lot of the ninth range of Bedford a bed of magnetic iron ore three or four feet in thickness occurs at or near the junction of the gneiss with the crystalline limestone. Deposits of this ore are also said to have been recently discovered on the sixth lot of the third range, and on Black lake in the eighth lot of the fourth range of the same township; but no details are yet known with regard to them." Geology of Canada, 1863, p. 674.

surrounded by the strong magnetic attraction of the ore bed, the compass could not be relied on as giving a true bearing. Crystalline limestone overlies the mass, and the first hundred feet of the metalliferous strata show a vast bulk of ore, the upper portion of which chiefly was mined for smelting. Of the lower part, thirteen feet towards the bottom were also mined, but not to the same extent. Associated with the ore and the talcose slates accompanying it, diallage rock and serpentine occur, and a pale green rock, translucent on the edges, and harder than serpentine, deriving its character from the presence of pistachio green epidote; through this green rock the ore is usually very thickly disseminated. The upper metalliferous beds suffer in quality from the presence of iron pyrites, from which the lower beds appear to be wholly free, thus yielding a much finer quality of ore. This part of the mass was not resorted to while the smelting works were in operation, until a short time before they were abandoned; but when the ore from it was used the daily yield of iron, I am informed, was increased in the ordinary process of smelting from three and a half up to four and a half and five tons.[13]

Ore deposit north of Crow lake.

"On the north side of Crow lake, about 300 yards from the shore, on the twelfth lot of the third concession of Marmora, magnetic oxide of iron occurs, thickly but irregularly disseminated in a pale green epidotic rock, similar to some portions of the rock of the Big Ore bed. At the time the Marmora works were last in operation an opening was made at this place which shows a breadth of twenty to thirty feet, all of which contains the ore, sometimes distributed in patches in the direction of the stratification, and sometimes in large irregularly shaped lumps and solid masses. The bed runs nearly east and west, apparently dipping south, and was readily traced for about 300 yards to a clearing, where it terminates in a sharp cliff. Such of the ore as was used at the works is represented to have proved of excellent quality, and to have added considerably to the daily yield of smelted metal; it seems to be peculiarly free from pyrites. The rock along the north shore of Crow lake is frequently of the pale green color and epidotic character which marks this ore bed, and has grains of magnetic iron diffused through the mass, from which circumstance it appears probable that the ore-bearing portion is continuous, although it may not in all places be equally productive. The course of this ore westward would at length carry it to an intersection or junction with the northwestward course of the Big Ore bed; and the dip of the one bed being south and the other northeast, it seems probable that they may prove to be different parts of the same bed on the opposite sides of a synclinal form.[14]

In Seymour.

"At Allan's mills, on the twenty-fifth lot of the twelfth concession of Seymour, where the dome of Laurentian rock protrudes through the fossiliferous limestone, magnetic iron ore is thickly disseminated in the rock over all the area exposed, which is about two or three acres. The rock on the left bank of the river appears to be a conglomerate of the Laurentian series, in which the presence of rounded forms supposed to be pebbles is perceptible on the smooth polished surfaces, where they display various colors; but these pebbles, when the mass is broken across, are so intimately blended with

[13] "Many years ago a blast furnace was erected at the village of Marmora for the purpose of smelting the ore from this deposit, and iron of a superior quality was manufactured. More recently different companies have for short periods made renewed attempts to smelt the ore with very satisfactory results so far as the quality of the metal was concerned. The distance of the place from a shipping port was however found a serious obstacle to success, and the furnace is for the present abandoned." Geology of Canada, 1863, p. 676. See also pp. 14-22 of this Report.

[14] "An opening which has been made here exposes a breadth of from twenty to thirty feet, through which the ore is irregularly disseminated in lumps and masses running with the stratification, which is nearly east and west, and apparently with a southward dip. The bed was traced for about 300 yards to a clearing, where it terminates in a sharp cliff." Geology of Canada, 1863, p. 675.

the matrix as to seem almost perfectly homogeneous with it; the iron ore in the conglomerate is disseminated only in small crystals and thin strings at wide intervals, but the succeeding rock, which seems to overlie it (the dip being to the southeast), and is a strong and tough mixture of whitish felspar with dark green pyroxene, yellowish-green epidote and occasional patches of red felspar, holds magnetic iron ore in considerable quantity. The breadth of the ore-bearing portion is at least thirty yards, and the run seems to be nearly parallel with the river; but although the distribution of the ore is pretty general, it scarcely appears to be in sufficient abundance, so far as may be judged from surface specimens, to be worked with advantage.

"There are other places in Marmora and the adjoining townships where iron ore has been found, and some that have been partially worked, one of which was on the ninth lot of the eighth concession of Marmora, in which a fine-grained hematite in patches constitutes the ore. Near the ore bed are large loose masses of rock with dark red garnets in cavities or druses associated with pyroxene and calcspar. Specular oxide of iron is known to exist at some place near the Deer river, north of Belmont lake. I procured a few specimens of it from a person who had been diligently working the ore under the delusion that it contained from forty to sixty per cent. of silver. What the character of the vein or bed in which it occurs may be it is not in my power to say, as I did not succeed in finding the place, nor could I get any satisfactory account from those who had visited it. In almost all parts visited this year, but more especially in the back settlements, a great number of the inhabitants are possessed with the delusive belief that the precious metals abound among the rocky ridges of the Laurentian country, and that they by their own individual exertions are capable of realizing vast wealth. Iron pyrites, mica, plumbago, specular iron, galena and other bright or metallic substances are indiscriminately collected, barrelled and buried in the woods, with the full impression by those engaged in such business that they have stored away so much gold and silver; and although every second person met with had a specimen of some sort to present, with anxious enquiries as to its nature, hardly a single individual could be found who was willing to give the smallest information as to its locality. It was in vain to argue with such persons that the consequences of a proper examination might possibly be more advantageous to the common interest than anything they were likely to accomplish in secret and unassisted; such an argument was only regarded as the result of a governmental scheme to deprive them of their imagined wealth; and an appearance of anxiety to procure information only rendered their secrecy the more profound.

Indications of hematite and specular ores.

Delusive beliefs of the possession of mineral wealth.

"The specular oxide of iron was seen during the season's examination in a few places, but in no one instance in anything like sufficient quantity to be of any economical importance."[15]

Macfarlane's Report on the Hastings District.

A second report on the geology of the Hastings district was made by Thomas Macfarlane in 1865, when several locations reported upon by Mr. Murray were again examined, together with some others not previously known. Among the beds of magnetic iron ore which Mr. Macfarlane found to occur in large or apparently remunerative quantity are those on the following locations: Lot 3 in range 5 of Elzevir, 19 in 1, 11, 12 and 17 in 5, and 25 in 6 of Madoc, 13 in 3 and 6 in 9 of Marmora, and 7 and 8 in 1 of Belmont.

Referring to the Seymour bed, Mr. Macfarlane says the strike of the ore is almost at right angles with the rock of the neighborhood, which perhaps is owing to the proximity of the granite. The overlying rock is chlorite slate,

The Seymour bed.

[15] Geological Survey of Canada, 1852-3, pp. 137-42.

and chlorite also occurs intermixed with the ore. A great part of the ore is solid and free alike from rock and pyritous impurities. The same bed is supposed to continue through lots 9 and 10 in the sixth range, 8 in the seventh and eighth and 12 in the fourth, but no deposits of importance were found on these lots.

On lot 19 in the first range of the same township a partially exposed bed was observed which had an apparent thickness of twenty-five feet, but it could not be accurately measured. The compass was found to be quite useless near it, varying very greatly from a due north line on approaching the deposit and as much as 90 degrees when immediately over it. The ore was stated to be in great part pure and solid, but some of it contained iron pyrites.

Referring to the Big Ore bed of Belmont, Mr. Macfarlane observed that a very considerable part of the difficulty experienced in treating the ore from this mine at the Marmora furnaces must be attributed to the fact that no attempt was made at sorting it, in consequence of which it contained too large a proportion of pyrites. "The substance which principally forms the matrix of the ore is a pyroxenic greenstone, the nature of which was not all taken into consideration in the metallurgical treatment of the ore. It doubtless contained comparatively little silica, and required probably little or no limestone to flux it. On the other hand, its poverty in alumina would render the addition of clay or lime of much advantage in its treatment in the furnace." There were two principal openings at this mine about 250 feet apart, the dip in the most northerly, which is the principal one geologically, being 60° north-eastward, and in the other 80°.

A cause of failure in smelting ore of the Big Ore bed.

The bed on lot 6 in the ninth range of Marmora, known as the Marsh ore bed, has the same strike as that of the Big Ore bed, namely, northwest and southeast, and the dip is 50° northeastward. Much of the ore was found to be pure and solid, but a large quantity of it was contaminated with iron and copper pyrites.

The Marsh bed in Marmora.

Several beds of hematite ore were also reported upon by Mr. Macfarlane as occurring in the townships of Madoc, Elzevir and Marmora, but none of them in large quantity. [16]

Hematite.

Archæan Rocks of Eastern Ontario.

Mr. Vennor's reports on the region from Marmora lake to the Ottawa river.

The first detailed examination of the Archæan rocks in the eastern part of the Povince, and the economic minerals which they contain, was begun by Mr. Vennor in 1866 under the direction of Sir William Logan, and was continued for a period of ten years. The territory surveyed by Mr. Vennor extends in an easterly direction from Marmora lake through Hastings, Addington and Frontenac to the Rideau waters in the northwestern corner of Leeds, and thence northerly through Lanark and parts of Renfrew to Allumett island in the Ottawa river. The rocks lie in a series of troughs running with the course of the belt, and from the various reports made upon them it is apparent that their geological relations are not easily understood. In the earlier reports they were described as belonging to the Laurentian system. Mr. Vennor at first was disposed to classify them as Laurentian and Huronian, and subsequently as a new series to which the name Hastings was given. Other classifications of rocks were also made in the course of his work, especially in the county of Lanark; but in the final report, reviewing the whole field of exploration, the general conclusion arrived at was that they consisted of two divisions, the lower composed of gneiss and syenite and the upper of gneisses and crystalline limestones. The latter he described as occurring altogether upon the southern side of the belt, and dipping under the lower Silurian formations which cover the country southward to the St. Lawrence. Mr. Vennor was also of opinion, from his first year's observations in Hastings,

[16] Geological Survey of Canada, 1863-6, pp. 97, 103.

that the magnetic iron ores were included in hornblendic and pyroxenic rocks which constituted the second of the three divisions into which the formations of Hastings and Addington were grouped; but examinations upon other parts of the field proved that this conclusion was not tenable. It follows therefore that the theory interwoven into the first extract which follows is not to be entertained. It may be indeed that the occurrence and origin of iron ores in this district must be studied anew before a theory can be adopted which would possess practical value for the explorer and the miner. Mr. Eugene Coste, who spent the seasons of 1884-5 in Hastings and the adjoining counties north and west of it, arrived at the conclusion (at variance with the views of Logan, Hunt, Harrington and Vennor) that both the iron ores and the apatite found in the Archæan rocks are of igneous or eruptive origin, which is important if true. But his report and geological map have not yet been issued, although their early publication was promised several years ago.[17]

In the report of 1866-9, after three years of work in the Hastings and Addington field, Mr. Vennor thus describes the occurrence of iron ores in the townships of Madoc, Marmora and Belmont—his three divisions of rocks, A, B and C, being premised:

Iron ores in Madoc, Marmora and Belmont.

"The deposits of iron ore in Madoc, Marmora and Belmont, which occur in the ferriferous band at the base of the greenish hornblendic and pyroxenic rocks, have been alluded to in several of the early annual reports of the survey; they have also been noticed in the General Report on the Geology of Canada for 1863, pp. 675 and 676, and again in greater detail in Mr Macfarlane's report for 1866. In these various reports however they have been described as separate local deposits, a sufficient number of facts not having then been accumulated to unite them in one continuous horizon. But having during the last three seasons, in accordance with your instructions, examined them more in detail with relation to the rocks in which they are enclosed, I have been able to satisfy myself that, with one or two unimportant exceptions, nearly all the deposits of magnetic oxide in the district will be found in the present division [B], being sometimes its only representative. As the deposits of iron ore already known in this zone are of economic importance, and as other yet undiscovered masses of a similar character may exist, I shall, with a view of aiding the search for them, here give a somewhat minute description of the course in which it appears to me they will be found to run.

The ores in a continuous horizon.

"The Seymour ore bed is situated on the eleventh lot of the fifth range of Madoc, where the associated hornblendic and pyroxenic rocks, and certain chloritic slates there occuring, are well displayed. Their course from this lot is about S. 65° E. (mag.), and passing through the tenth and ninth lots of the sixth range, and the eighth and seventh of the seventh range, along which course the ore is almost continuous, it becomes partially covered up by the unconformable Lower Silurian limestone; but turning over the axis of an anticlinal it can be traced curving through the seventh, eighth and ninth lots, and part of the tenth in the eighth range, whence it strikes N. 65°-70° W. (mag.) through the tenth, eleventh and twelfth of the seventh range, and thence through the thirteenth, fourteenth and fifteenth of the fifth range. On the last named lot a deposit of magnetic ore occurs perhaps next in importance only to the Seymour bed, and it is worthy of note that its place here is exactly opposite to this bed and on the other side of the anticlinal mentioned, on the crown of which occurs a coarse red syenitic rock, (A 1) which has been before referred to. From the seventeenth lot of the fifth range the course of the iron-bearing rocks gradually tends westerly, and would appear to pass through the seventeenth and eighteenth lots of the fourth range, the eighteenth of the third and the eighteenth and nineteenth of the second and first ranges.

A belt of ore traced from the Seymour bed to the Bi[illegible] bed.

[17] I learn from Dr. Selwyn that the delay has occurred through failure of Mr. Coste to furnish his report on the district. The map was printed several years ago, "but it has been reserved, daily expecting the report which ought to accompany it."

On these last named lots in the first range the ore is probably again in considerable quantity, but the traces of it occur only in loose masses in the soil, the ore in place being apparently at a considerable depth beneath the surface. From these lots the band runs into the township of Marmora, and, changing its direction, trends southward, keeping almost immediately to the east of the Moira river, the course of which might almost be said to denote its further run through this township. On the nineteenth and eighteenth lots of the eleventh range this iron zone is represented by rust-stained slates, holding some considerable beds of yellow sulphuret of iron with traces of magnetic iron ore, and here it is closely associated with a large mass of coarse white granular limestone. Thence it runs southward through the tenth, ninth and eighth lots of the ninth range, where the McCallum iron ore bed, mentioned in an early report, is situated; while farther southward its course is indicated on the sixth and seventh lots of the eighth range, by the occurrence of the Marsh ore bed. A short distance beyond these last lots the ferriferous belt must run under the main body of the Silurian limestone lying to the south and to the east, where it is lost sight of. But while thus covered it appears to change its course, and bearing westward emerges at Marmora village, where the green hornblendic and epidotic rocks are marked by traces of magnetic iron ore, and hold veins of red hematite. These rocks are seen running into Crow lake, under the waters of which, and under the adjoining unconformable overlying horizontal lower Silurian limestones, the greater part of the strata of this division are concealed. The north shore of the lake however gives evidence of the course of the belt in the Kean ore bed, which occurs on the thirteenth lot of the third range of Marmora, and in an exposure protruding through the Silurian limestone on the sixth lot of the first range of this township. The Big Ore bed, on the south shore and western extremity of the lake, in Belmont, belongs to the same belt, and is probably brought up on a third line of elevation to the westward.

"Northeastward through Belmont no very large exposures of the ore have yet been observed; but deposits may still be found between Crow and Belmont lakes, along the western shore of the latter, and up the valley of the Crow river, as well as on Deer lake, about the twenty-fifth, the twenty-sixth and twenty-seventh lots of the second and third ranges. The exposure at Allan's Mills, on the twenty-fifth lot of the twelfth concession of Seymour, noted by Mr. Murray in his report for 1852-53, has probably some relation to the turn which occurs in the course of the belt in Belmont lake, but whether united by a continuous outcrop, or separated on the opposite side of an anticlinal form, the overlying Silurian limestone prevents us from deciding.

Tracing the belt eastward from Seymour bed.

"Returning to the Seymour bed in Madoc, with the view of tracing this belt eastward, we find very few deposits of the ore of any extent. On the twelfth lot of the fourth range we have a small bed of magnetic iron ore, and again on the sixth lot of the third range, beyond which, southward, the belt runs under the Silurian. At the eastern end of Hog lake, on the Moira river at Downey's rapids, magnetic iron ore is again met with, and finally in Elzevir, on the third lot in the fifth concession, where it occurs in a bed from two to three feet thick enclosed in a steatitic material, as mentioned by Mr. Macfarlane in the report of 1866.

A belt from Madoc northward into Tudor.

"Where the rocks of division B are brought up in the northwest quarter of Madoc magnetic iron ore has been found on the twenty fifth lot of the sixth range of Madoc, where a small bed occurs dipping to the northeast at an angle of from forty to forty-five degrees. The only other locality is in the extension of the belt farther north, on the fifty-fifth lot on the west side of the Hastings road in Tudor, where it is associated with gneiss and granular limestone (A3 and A4). This last locality has not been mentioned in any of the previous published annual reports, but samples of the ore were [illegible]

you to the London Industrial Exhibition of 1862. The ore would appear to be of excellent quality, although more or less mixed with graphite. The breadth of this bed could not be determined, owing to the wood-covered condition of the country, but from the large masses of ore scattered about in the vicinity there is little doubt that it occurs in abundance.

"It is probable that other beds of this ore will yet be found along the course of the rocks B, whose distribution has thus far been partially pointed out, and will be further understood from the description to be given of the next overlying division C, at the base of which this ferriferous belt occurs."

Working the Big Ore or Blairton mine.

Referring subsequently to the Belmont ore bed, Mr. Vennor states that in 1857 an American company was established for the purpose of working the property, and that after trials of several parts of the band the portion near the base was found to be of suitable purity for smelting. Three hundred men were employed in mining and sorting the ore that year, and towards the end of the season one hundred and fifty tons a day were carried by rail to Cobourg and there shipped to the American side where it was smelted at Pittsburgh. A few hundred yards southeast from the main work another excavation was made on what was called the Sandpit bed, from which a very pure ore was obtained. The ores raised from both mines were sorted into three grades, the two highest of which were selected for exportation, while the third was left on the ground for future disposal.[18]

Survey of Addington and Frontenac: classification of rocks.

In 1870 Mr. Vennor continued his survey eastward through portions of Addington and Frontenac, and while still classifying the rocks under the three divisions already referred to, he was able to summarise them briefly as follows, in ascending order:

A. Gneiss, fine, syenitic, with crystalline limestones and magnetic iron ores (Laurentian);

B. Diorites and diabases, passing into chlorite schists, often epidotic with steatite, and with magnetic and hematitic iron ores (probably Huronian);

C Dolomites, argillaceous, calcareous and micaceous schists, with gneisses.

Here it will be observed that iron ores are found to occur in the first division, differing in this respect from the occurrence of those ores in the Hastings district, and indeed Mr. Vennor states that the second division afforded no iron ores in the region examined during the season of 1870; they were found closely associated with the limestones division.

Tracing a belt from Howse mine in Bedford to North Crosby, fifteen miles.

Besides other localities previously referred to, in which ores were found in the township of Bedford, was one known as the Howse iron mine on lot 4 in the first concession, where a bed of solid magnetic ore had been uncovered for about twenty-five yards across the strike. Fifty tons was raised from this mine in 1869 for shipment to Charlotte, N.Y., and the ore was found of good quality. In the following year 100 tons was mined and drawn to Westport on the Rideau. Northeastward of the Howse bed magnetic ore was again found on lot 6 in the third and lot 8 in the fourth concession of the same township. These localities are referred to by Sir William Logan in the report for 1858,[19] where it was conjectured that they would be found to continue to one on lot 21 in the ninth concession noted by Mr. Murray in his report for 1852-3. This supposition Mr. Vennor was enabled to verify

[18] Geological Survey of Canada, 1866-9, pp. 150-2 and 161. Dr. Sterry Hunt in the same report, p. 258, states that much of the ore shipped from this mine to Pittsburg was found to be objectionable on account of the considerable proportion of sulphur which it contained, but that the Sand-pit bed yielded a much purer ore. Mr. J. L. Aunger of Blairton has sent me the following note under date of December 8 concerning the present condition of Blairton mine: "It is the most strange thing I know to see this mine, with its half-million tons or more of iron ore within three miles of the Canadian Pacific Railway lying idle, and parties passing it by going 40 miles or more from a railway looking for iron ore. If the same body of iron could be placed 40 miles in the woods where attention is given to seeking for minerals it would take well, and the first thing would be, 'Now then, for a railway to it.' I know what I am writing as to the quantity of ore in this mine, and don't fear to meet it in print."

[19] See p. 35 ante.

having traced a zone of the iron-bearing rock from the Howse mine to lots 20 and 21 in the ninth concession of Bedford and thence northeastward to lot 19 in the eight concession of North Crosby at Spectacle lake, a distance of fifteen miles.

Allan's mine in North Crosby: the belt traced through South Sherbrooke and Bathurst.

A deposit of magnetic ore on lot 27 of the fourth concession of North Crosby seemed to Mr. Vennor to be a most valuable one, and it would appear to form the first of another series of similar deposits stretching northeastwardly through South Sherbrooke and Bathurst. The ore is a fine crystalline magnetite, and the openings showed the existence of a large amount. Explorations of the property were made in 1868 under direction of the owner, Hon. George W. Allan, and about 100 tons of ore was raised, but the untimely death of the miner in charge caused the work to be discontinued.[20]

Fournier and Bygrove mines, and other occurrences in Crosby and Bathurst.

On lot 14 of the first concession of North Crosby there is apparently a bed or belt of magnetic ore parallel to Mr. Allan's deposit, known as the Fournier mine, and on lot 3 of the same concession is the Bygrove mine. The latter had been opened during 1869 by Mr. George Oliver of Perth, who mined about 150 tons of a very fair quality of magnetic ore. Other occurrences of iron ores were found on lots 17, 18 and 19 in the third concession of this township bordering on Christie's lake, and again on the 10th and 11th lots in the eighth concession of Bathurst, which had been worked to some extent by a Perth company. On the last mentioned lots the magnetic ore was found to be much mixed with a fine crystalline green apatite.

The Dalhousie mine.

On the east half of lot 1 in the fourth concession of Dalhousie a valuable deposit of hematite ore was opened in 1866 and was worked for several years. The bed is described by Mr. Vennor as averaging seven feet in width in a band of crystalline limestone, and dipping at an angle of 45° to the southeastward. Six shafts of eight by ten feet and varying from 20 to 68 feet in depth had been sunk by November, 1871, and about 10,000 tons of ore was raised. The ore was drawn to Perth, a distance of twelve miles, in summer at $1.75 per long ton, and in winter at $1; from there it was taken by rail to Brockville and thence shipped to Cleveland, where it was laid down at a cost of $5 per ton. The ore was claimed to average 60 per cent. of iron, according to numerous analyses made in the United States, but six determinations in Canada afforded an average of 57 per cent., with about .025 phosphorus.[21]

Shipments from the Chaffey and Yankee mines.

In a note upon the Chaffey mine in South Crosby to which reference has already been made, Mr. Vennor found in 1871 that two excavations had been made to a depth of thirty feet in a solid bed of magnetic iron ore, and during that year, with twelve men employed, 3,500 tons of ore was raised and shipped to Cleveland via Kingston. At the mine this was worth $2.25 per ton, and delivered at Cleveland it brought from $6 to $6.50 per ton. The

[20] In a letter received from Senator Allan that gentleman says: "Unfortunately the person I employed, a Mr. Otey, was taken suddenly ill and died without making any full report as to the nature and extent of the deposit. Since then I have not taken any steps to have the property further developed. Iron mining except in a few places had gone down. My property labored under the disadvantage of being five miles from water communication at Newport, and at that time there was no railway passing near it, and so I have allowed it to remain, being satisfied that whenever iron mining revived and was carried on extensively my property would come into play." In the Report of 1866-9 Sterry Hunt gave an analysis of the ore, showing it to contain 64.9 metallic iron, 1.03 titanic acid, 1.33 alumina, .82 lime, .84 magnesia, .007 phosphorus, .120 sulphur, traces of oxide of manganese, and 5.25 insoluble matter, chiefly quartz, with a little black mica and green pyroxene. Dr. Hunt says: "This is a very fine and valuable ore, and the deposit would seem to be worthy of careful examination."

[21] Geological Survey of Canada 1870-1, pp. 312-4; also do. 1871-2, p. 122. "The production from February, 1872, to the end of February, 1873, was forwarded to Perth at $1 per ton, in loads which averaged three and three-quarter tons; thence to the Rideau canal at 60 cents; thence to Kingston at $1.25 to $1.50, and thence to Cleveland at from $1 to $1.50. The total production from 1870 to 1873 has been rather over 11,100 tons. The wages of the hands employed have varied from 80 to 90 cents. per day, with board."—Vennor's Report for 1872-3, p. 177.

cost of carriage to Kingston, a distance of 44 miles over the Rideau canal, was 75 cents per ton. About one hundred rods north-northeast from the Chaffey mine, and on a continuation of the same bed, is the Yankee or Matthews mine, upon which work was commenced in 1860. The opening made here had a depth of 40 feet in 1871, during which year fifteen men were employed, 4,000 tons of ore was mined, and 3,300 tons sold and shipped to Cleveland, where the price obtained was the same as for ore of the Chaffey mine. The total amount of ore sold and shipped to Cleveland from these two mines for the two years 1870 and 1871 amounted to 14,520 tons.

Referring to the quality of ores from these and other mines in the locality, Mr. Vennor made the following notes in his report:

Quality of iron ores in the district.

"Samples of ore from the Chaffey, Yankee, Bygrove, Fournier and Foley mines were, in accordance with your instructions, submitted to Dr. B. J. Harrington for analysis. The following figures show his determination of the percentage of metallic iron in these ores, but more time will be required for their complete examination:

Chaffey mine	52.91	per cent.	metallic iron.
Yankee mine	52.09	"	"
Bygrove mine	59.55	"	"
Fournier mine	59.59	"	"
Foley mine	58.69	"	"

Titaniferous ores.

"The ores from the Chaffey, Yankee and Foley mines were all found to be titaniferous. That of the Chaffey mine is stated by Dr. Hunt to contain 9.80 per cent. of titanic acid. Dr. Harrington finds 12.32 per cent. of titanic acid in the ore from the Yankee mine, and also a large amount of sulphur, which renders it altogether an inferior ore. The ore from the Foley mine contains only 2.68 per cent. of titanic acid, which is not a sufficient amount to detract from its value. The Chaffey and Yankee ores were also examined for phosphorus, but neither of them was found to contain a weighable amount. The Bygrove and Fournier ores are free from titanium, and I think it extremely probable that they will be found to belong to beds somewhat higher in the series than the titaniferous ores."[22]

Iron ores found in association with crystalline limestone bands.

Other explorations in this region during the season of 1872 appear to have convinced Mr. Vennor that the iron ores were only to be found in connection with crystalline limestones. Magnetic iron ore was reported to exist in the gneiss area of Frontenac, in the townships of Kennebec, Clarendon and Palmerston, but Mr. Vennor found them only in grains or in connection with dykes, and nowhere in sufficient quantity to be of economic importance. The entire absence of crystalline limestones in this section he mentioned as a fact worthy of note, and although it might be premature to say positively that all the available deposits of magnetic or other ores of iron occur and are to be sought for in proximity to such limestones, still the accumulation of evidence over a great extent of country examined would appear to point in this direction.[23]

During the season therefore the bands of crystalline limestone were by him made a special object of investigation; first, because they presented characters which enabled them to be much more easily followed than any of the intervening gneiss bands; and, secondly, because that with them, or in close proximity to them, are deposits of iron ore and apatite in economic quantities. Cross sections of the country were made through the townships of Oso, Olden and Bedford, as well as through South Sherbrooke, in which six distinct bands of limestone were observed having a southeastward dip varying from 28° to 60° and running for the most part in east and west lines, but after being traced a distance of 20 or 25 miles eastward they were

[22] Geological Survey of Canada, 1871-2, p. 123.

[23] Geological Survey of Canada, 1872-3, p. 145.

found to curve in a northeasterly direction; and in relation to these bands of limestone the attempt was made to assign the geological horizon of the iron ores. The occurrence of ores, Mr. Vennor observes, appears on lines which bear a certain relation to the occurrence of some of the bands of limestone and form distinct horizons which can be followed and in which other deposits of iron may be sought for. Immediately above the sixth and highest of those bands magnetic iron ore occurs in South Sherbrooke in two places, viz., at the Bygrove mine on the third lot of the first concession, and at the Fournier mine on the fourteenth of the same range, as well as in other places on the same horizon to the eastward through Bathurst and to the southwestward through Bedford. At the base of the fifth band ore occurs along the northern shore of Christie's lake in the same township, in the eighteenth, nineteenth and twentieth lots of the third concession, at what was then known as the Watson mine. Immediately below the fourth band ore was found at the Foley mine on the tenth lot of the eighth concession of Bathurst, whence it could be traced through the eleventh, twelfth and fourteenth lots of the same concession. Here for the first time apatite was found in considerable deposits closely associated and in some instances intermixed with the iron ore. In the third, second and first bands of limestone no magnetic ore had been met with by Mr. Vennor, although at the base of each of these rust-colored strata occur; yet he observes as worthy of note that the great bed of hematite in Dalhousie township upon which is situated the Dalhousie mine is found between the first and second limestone bands, and the general conclusion is thus stated: "From the foregoing it will be seen that in the section of country so far examined by me magnetic iron ore has been found only in connection with the three highest bands of limestone, while in the other bands it is represented by only rust-colored beds of gneiss and quartzite."[24]

Magnetic ore in the higher limestone bands.

[24] Geological Survey of Canada, 1872-3, pp. 159-162. In the report for 1873-4 Mr. Vennor appears to have doubted the occurrence of the sixth band of limestone. Of the fourth and fifth he gives the following description, pp. 105-6:

"The Crow lake, Rock lake and Silver lake band of limestone is well marked and important. It is separated from the last by a great volume of granitic gneiss, which is probably not less than eight to nine thousand feet thick. From Eagle lake, in the northeastern corner of the township of Hinchinbrooke, it has been traced to the head of Crow lake, in Oso; thence northeastward to Rock lake, a small lake situated close to the townline of South Sherbrooke. Entering this last township, it runs through portions of the fifth and sixth concessions, passing a little to the north of Silver lake, and enters the sixth concession of Bathurst, whence, again trending northeastwardly, it passes through the seventh concession to the eighth concession line, which it follows, in a nearly direct course, to Balderson's Corners on the line between Bathurst and Drummond townships. In Drummond it immediately runs under a heavy drift, and shortly after is capped by rocks of Lower Silurian age. The distance from Eagle lake to Balderson's Corners is about twenty-six miles. A remarkable feature of this band is that it immediately overlies a zone of rock containing magnetic iron ore and deposits of phosphate of lime. These minerals were observed in proximity to this limestone at Eagle lake, at Crow lake in Bedford and Oso, and again at the Foley and McVeigh lots in Bathurst, in which last locality both have been mined to a small extent. The limestone has also interstratified with it a number of subordinate bands of red felspathic bands, which separate the whole into a number of unequal parts. The largest calcareous bed does not exceed 150 feet, but the total thickness from the base of the lowest bed of limestone to the top of the highest may be estimated at not less than 2,600 feet. The limestone is coarsely crystalline, and holds in abundance small scales of a yellowish-brown mica, and less frequently graphite.

"The Bob's lake, Tay river and Meyers lake is perhaps the most important band in the whole sequence. It is separated from the last by a great volume of gneissic strata, which has a transverse measurement of over 13,000 feet. This may or may not represent the actual thickness of the gneiss, as the strata are all in a nearly vertical attitude, and there is no evidence of any repetition of the beds. The limestone was continuously traced from the southern extremity of White lake in Bedford, across Green bay and Bob's lake, to the Tay river in South Sherbrooke, and thence along the general bearing of this river to and across Meyers or Christie's lake into the township of Bathurst, where its course is shortly concealed by heavy drift. The distance from White lake in Bedford to the last position in which the band was noted in Bathurst is about twenty-two miles. The thickness cannot be less than 2,600 feet, and the limestone differs in a marked manner from either of the four inferior bands. It resembles them in being white, but is much more coarsely crystalline. Graphite is abundantly disseminated through it in brilliant plates or scales, and there are also layers of white quartzo-felspathic rock associated with it, which occur both in the form of interstratified beds and irregular masses. This may, for the present, be considered as the

The following account is given by Mr. Vennor of the Watson mine at Christie's lake :

Watson mine at Christie's lake, South Sherbrooke.

"This location is situated on the eighteenth, nineteenth and twentieth lots of the third concession of South Sherbrooke, and embraces an area of 259 acres ; the openings made are on the first and last numbered lots. On a high bluff on the north shore of the lake, on lot eighteen, three beds of iron ore have been uncovered and to some extent worked during the last summer. The strata, which here consist of dark grayish and greenish hornblendic gneiss, dip to the southward at angles varying from 15° to 80°. The uppermost bed of ore, and the nearest to the lake, has been uncovered for about thirty-five feet in length by twenty-four in breadth, and a considerable mass of ore has been exposed. No walls have yet been reached, and I think it is probable that the uncovering has been extended on the face of the bed rather than across its outcrop. In the second and underlying bed a breadth of eighteen feet of ore has been uncovered, and can be traced by openings made on its course for a distance of upwards of 150 feet. In the third and lowest bed a well defined foot wall of gneiss has been struck, and a solid mass of ore is exposed measuring eighteen feet in width. The extreme distance between the openings on this property on the strike of the ore beds is nearly one mile, and the distance between the top of the upper and the bottom of the lower bed of ore is about 300 yards. Several hundred tons of ore have been taken out, but operations have been chiefly confined to the determination of the extent of the deposits, which is now pretty satisfactorily known. An experimental shipment of the ore has been made to Cleveland, and it is reported to have given perfect satisfaction to the smelters, and it has further been ascertained that this ore will produce a quality of iron well suited for the manufacture of Bessemer steel. An analysis made by Dr. Harrington of a sample of the ore which I brought from this location gave as follows :

Metallic iron	65.62 per cent.
Titanic acid	2.83 "
Phosphoric acid	0.05 "
Sulphur	Not determined.

"It may be further stated that the facilities for mining here are favorable : the position of the ore on a high hill affords easy and cheap drainage, and a ready means of disposing of the *debris*, and these mines can probably be worked for a considerable time before resorting to expensive underground operations."[25]

Further explorations in Frontenac and Lanark.

More careful explorations of the counties of Frontenac and Lanark were made by Mr. Vennor during the season of 1874, and a number of newly discovered or until that time little known mining locations were noticed by him in the report of his work during that year. Several of these are deserving of mention. In the vicinity of Eagle lake, in the northeastern corner of the township of Hinchinbrooke and along the westerly boundary of Bedford, iron ore was found in several localities, principally on the twenty-sixth, twenty-seventh and twenty-eighth lots of the first concessions of both townships, but chiefly on the twenty-ninth and thirtieth lots of Bedford, near the lake shore. The magnetite occurs there in a bedded form associated with heavy, dark hornblendic and dioritic rocks, which in a number of instances are met with in close connection with the ores of iron in this section of country. Fair exposures of ore have been made at several places, but the beds are extremely

highest band of limestone in the series, and it belongs to the synclinal forms which I have yet to bring under your notice as occurring in Bedford and Loughboro'. It is overlaid by a considerable volume of gneissic strata in which there also occurs a small band of limestone—the Farren lake band—as noticed (Report of Progress, 1872-3, p. 160) but which may be left out of consideration for the present. At its base, and also at some distance above it, there are important deposits of magnetic iron ore, a fact which has already been dwelt upon in my previous reports."

[25] Geological Survey of Canada, 1872-3, p. 174.

irregular. The ore itself is described as a beautifully crystalline magnetite, yeilding according to Professor Chapman's analysis 62.52 per cent. of metallic iron. It also contains traces of phosphorus, a very small amount of sulphur and about 3.23 per cent. of titanic acid. One serious drawback however exists in the fact that apatite is associated with much of the magnetite, both in the form of grains and crystals. The crystals are easily separated from the ore, but the finely disseminated granular portions are so intimately intermingled as to be inseparable. A similar association of magnetite and apatite exists at the Foley mine in Bathurst, and appears to characterise the lowest horizon of iron ore deposits Mr. Vennor mentions, in proof of the stratigraphical arrangement of the ores, that the position of the Eagle lake deposit in relation to the overlying band of limestone is the same as that of the Foley mine, and this band of limestone having been continuously traced from one locality to the other, a line may be drawn which will in all probability show the course along which other masses of iron ore may be expected to occur. Another characteristic of the iron ore of this horizon is that it is generally of a coarsely crystalline character, it being found both at the Foley mine and at Eagle lake in large octahedral crystals, the axes of which are often more than an inch in length, but the occurrence of these crystals would in itself be no proof of the deposit being a vein. "At Eagle lake," Mr. Vennor says, "the magnetite seems to occur as an unmistakable bed, and between the Foley and Eagle lake mines it is found in several localities in disseminated grains and strings in a peculiar stratified dioritic rock which is apparently made up of the same constituents as the more coarsely crystalline diorites, with no traces of stratification. These coarse varieties of diorite occur as lenticular or irregular shaped masses at perhaps two or more horizons, and they are often unaccompanied by iron ore." It is observed that most of the diorites are undoubtedly interstratified masses In Hastings they are fine-grained, as is also the magnetite, while in Frontenac and Lanark, where the diorites are coarsely crystalline, the accompanying magnetites are of the same description.

Coarsely crystalline magnetic ore.

Another location of iron ores is in the vicinity of Silver lake in South Sherbrooke, where they were discovered during the summer of 1873. These, upon careful examination, were found on an extension of the iron ore beds of the northern shore of Christie's lake. They occur on lots 13, 14 and 15 of the fourth concession of South Sherbrooke, and openings made upon them showed the strike of the bed to be about northeast and southwest, with a steep dip to the southeastward. The ore is of much the same character as at Christie's lake, and is a compact, bluish-black magnetite containing about 64 per cent. of metallic iron and less than 2 per cent. of titanic acid. The following analyses show the close comparison between the ores of the two localities :

Silver lake and Christie's lake ores, in South Sherbrooke

	Silver lake.	Christie's lake.
Magnetic oxide of iron	88.59	90.61
Titanic acid	1.78	2.14
Insoluble residue	5.77	0.00
Metallic iron	64.15	65.62

Reference has already been made to a deposit of magnetic ore on lot 21 of the ninth concession of Bedford, near Wolf lake.[26] This location was carefully examined by Mr. Vennor with the dip needle, and he had reason to suppose that ore existed in considerable quantity. "The bed or beds of ore here," he says, "are undoubtedly on the course of the ferriferous horizon upon which is situated the Hon. G. W. Allan's deposit in North Crosby, and form an outcrop upon the opposite side of the synclinal which exists between these deposits and the Fournier and Bygrove mines. Other exposures of magnetic iron ore, near Wolf lake, on 24 or 25 of the tenth

Tracing the Wolf lake deposit in Bedford

[26] Ante pp. 35 and 48.

concession, are probably on the run of those on lot 21 of the ninth concession of Bedford. The two localities are fully one mile and a quarter apart, and it is more than probable that further discoveries will be made in the intervening country."

Spectacle lake deposits in North Crosby.

A mile to the eastward of Wolf lake, on 18 and 19 of the eighth concesion of North Crosby, are the Spectacle lake deposits. The ore occurs in diorite and appears to exist in considerable quantity, but it contains many impurities. The property was worked at one time by an American company, but after one shipment the enterprise was abandoned. Mr. Vennor observes that the position of the deposit at a considerable altitude in what has been termed the Westport mountains is against its future prospects.

Ore beds south of Christie's lake.

The beds of ore on the south side of Christie's lake are quite distinct from those already noted as occurring on the northern shore, being in a much higher horizon, although lower than the Fournier and Bygrove ores. They occur between the road and the lake on lots 17 and 18 of the eighth concession of South Sherbrooke, and are immediately beneath the highest or Farren's lake band of limestone. The ore is said to be of an excellent quality, resembling that of the Fournier and Bygrove mines, but it does not appear to exist in quantity.

The other deposits in this region referred to by Mr. Vennor are those known as Mitchell's and Gordon's, the former in the rear of North Crosby and the latter near the town line between South Sherbrooke and Bathurst, but little was known respecting their extent or quality. The following particulars are given of four of the more important deposits or mines in this district :

Vennor

"*Howse Iron Deposit.* This is one of a series of outcrops of iron ore which occur at intervals from the fourth lot of the first concession to the eight and ninth lots of the fourth concession of Bedford. These have been known for a great number of years, and specimens of the ore were obtained by the surveyors when laying out the township upwards of sixty years ago. But excepting the little work done on the Howse lot (lot four, concession one), during the years 1869 and 1870 (see Report of Progress, 1870-1, p. 312), the deposits have up to the present time remained as they were originally found. The shipment of fifty tons of ore from the Howse deposit, in the year 1869, to Charlotte, N.Y., as far as I have been able to learn, was attended with satisfactory results, at least as regarded the quality of the ore ; but the long carriage, seventeen miles, over sandy and very hilly country to Westport village, on the Rideau, before it could be shipped to Kingston, proved a decided obstacle to the enterprise. The ores at the surface are not as pure as many of those in South Sherbrooke, and are more mixed with rock matter ; still this is in a great measure compensated for by their nearness to the Kingston and Pembroke Railway. For it will be remembered that the very impure iron ores of the Chaffey mine, near Newboro on the Rideau, have been mined for years successfully, merely in consequence of their being upon navigable waters, although the ore besides containing 9.80 per cent. of titanic acid, only averages about 50 per cent. of metallic iron. The Howse deposit is of an exceedingly irregular character, and it would be a difficult matter to draw any definite outline that might be said to represent the shape of the mass of ore. The greatest length however is on the strike of the bed, namely, nearly northeast and southwest, and at one place the breadth appeared to be from fifteen to twenty paces. Through this last distance however there are several *horses* of rock. Beyond these facts I can state nothing respecting this deposit. That there is visible a great quanitity of ore is undoubted, and as it can be mined in the cheapest manner, namely, by open cuttings, there seems no reason why it should not be profitably worked. The position of this and the adjoining beds of iron ore is almost immediately beneath the Wolf lake, Crosby lake and Pike lake band of limestone, which is the southeastern

In the township of Bedford.

Vennor.

outcrop of the Bob's lake, Tay river and Meyers lake band, on the opposite side of a synclinal form. (See Report of Progress, 1873-4 p. 104). Consequently these ores are in the same stratigraphical position as those represented by the Meyers lake and Silver lake deposits. This fact of the occurrence of outcrops of iron ore in the same stratigraphical positions, on both sides of a synclinal form, is, I think, sufficient proof of the continuity of the ore, not only in length but also in depth. The occurrence of strongly rust-colored gneisses in many parts of the Bedford basin or synclinal, between Bob's and Potspoon lakes, convinced me that this ferriferous horizon is brought, or almost brought, to the surface by undulations in several places between the two divergent outcrops of ore. It also seems to me highly improbable that the iron ore should have only been deposited to the limited extent seen along the two outcrops of the same horizon of rock.

"*Allan's Iron Ore Deposit.* This deposit of magnetite occurs on the twenty seventh lot of the fourth concession of North Crosby. It is close to the town line of South Sherbrooke, and a little over half a mile southeastward of the Fournier mine. Nothing whatever has been done here since the autumn of 1868, and the excavation then made by the Hon. G. W. Allan is filled with water and *debris*. The question therefore as to the extent of the deposit yet remains undecided; but as the surface indications are promising and the ore of good quality it is altogether probable that mining might be carried on with profit for some time. The route to the Kingston and Pembroke railway is the same as that from the Meyers and Silver lake deposits, viz: *via* the Tay river and Bob's lake, and from the Allan deposit to the Tay river the distance is about two miles. For the purpose of reference and comparison I append a partial analysis of this ore, taken from the table of analyses, Report of Progress, 1873-4:

In the township of North Crosby.

Magnetic oxide of iron	90.14=metallic iron, 65.27
Phosphorous	0.07
Titanic acid	1.03
Insoluble matter	5.25

The iron ore occurring on lot 27 of the seventh concession of North Crosby undoubtedly belongs to this horizon, but the distance between the two outcrops is about two and three-quarter miles.

"*Bygrove and Fournier Deposits.* Both of these deposits of magnetite occur in the first concession of South Sherbrooke and are in the same horizon. The Bygrove mine on the third lot has remained unworked since the year 1869, when it was to some extent worked by Mr. George Oliver of Perth. The Fournier deposit on the fourteenth lot however has from time to time been more or less mined. During the summer of 1873 the last attempt at raising this ore for the market was made. A shaft was sunk to the depth of one hundred and ten feet, and the company raised in all about 600 tons of good ore. At this depth however the deposit became very irregular and uncertain, and as the ore could not be extracted without the removal of much rock work was abandoned and has not been resumed since. I may here mention a fact respecting this iron horizon that is not generally known, namely, that at a short distance from the Fournier mine, on the fourteenth lot, the ferriferous belt passes beneath Farren's lake in the second concession, its strike changing and coinciding with the course of the lake. On its exit from the lake at its western end the zone again becomes clearly marked by the presence of iron, until on the third lot of the first concession we arrive at the deposit of ore constituting the Bygrove mine. Specimens of ore from these two deposits gave about an equal percentage of metallic iron, the Fournier yielding to analysis 59.59 per cent. and the Bygrove 59.55 per cent. In the Report in which these analyses were first given (Report of Progress 1871-2, p. 123) I further stated that the Bygrove and Fournier ores were free from titanium, and that it appeared extremely probable that they would be

In the township of South Sherbrooke.

found to belong to beds 'somewhat higher in the series than the titaniferous ores.' This supposition has since been clearly proved. They have been found to lie in the highest iron-bearing horizon and immediately below the highest band of crystalline limestone. The second or underlying belt is that on which are situated the Meyers and Silver lake deposits, the ore from which as we have seen contains from 64 to 65 per cent. of metallic iron and invariably a small percentage of titanic acid; whilst in the next or third underlying belt represented by the McVeigh, Foley and Eagle lake deposits, the ore is more titaniferous, and is further characterized by its peculiar coarsely crystalline character and by the presence of apatite or phosphate of lime. Vennor.

"I have thus I think with some degree of certainty succeeded in establishing the existence of three distinct horizons of iron ore, each of which possesses some peculiar characteristics by which it may be again recognized. Should such prove to be the case it will be a most important step gained, and an invaluable aid to future predictions respecting the iron ores of the Laurentian rocks."[27] Three horizons of ore established.

In the prosecution of the work of the Geological Survey on the Quebec side of the Ottawa river, Mr. Vennor was enabled to make some interesting comparisons between the occurrence of iron ores in the Ontario and Quebec districts. In the Report for 1876-7 he observed that the iron ore horizons marked by several iron mines in Hull and Templeton are in precisely the same relative stratigraphical position as the ore horizons of South Sherbrooke and North Crosby, as illustrated by the Silver lake, Christie's lake, Fournier and Allan mines. These horizons are beneath the true apatite-bearing rocks, although a few deposits of apatite have been found occasionally associated with and beneath them. One feature in connection with the iron ore deposits in the Ottawa section is deserving of mention, namely, the intermixture and interstratification of hematite with magnetite. In no one instance, Mr. Vennor says, does this condition occur in the corresponding iron horizons in South Sherbrooke or North Crosby, where the ore is invariably a crystalline magnetite. Hematite frequently occurs in Lanark county, both below and above the magnetic ore horizons, but always by itself or in association with apatite and pyrites. The distance between the South Sherbrooke and Hull deposits is about fifty-six miles in a direct line, and although no other important deposits of ore intervene this is mainly owing to the fact that most of the intermediate country is occupied by the flat-lying rocks of the Lower Silurian formation, which entirely conceal the lower crystalline rocks. The fact however that iron ore occurs in workable quantity in Hull township immediately where the crystalline limestones and gneisses first again become well exposed, gives, in the opinion of Mr. Vennor, considerable encouragement to those interested in this ore respecting its permanency in certain horizons of rock. "It must be borne in mind," he says, "that iron ore though often in all appearance a clearly interstratified mass is not a continuous deposit. It may occur at intervals for many miles in a section of country, and yet between the exposures of ore there may not be the slightest indication of its existence. Most of the large deposits of iron ore in eastern Ontario and in Ottawa county are exceptional occurrences, and their unusual extent is due to the recurrence of the outcrops of ore on anticlinal and on synclinal folds of the strata. For example the Big Ore bed in Belmont exhibits an anticlinal and synclinal fold; the Seymour ore bed in Madoc is a decided synclinal, in which two outcrops of iron ore each fifteen feet in thickness are sharply folded the one upon the other; while the great Hull iron ore bed consists of an anticlinal of magnetic ore through which breaks an inferior band of crystalline limestone. So often indeed is the importance of an iron ore deposit due to one or other of these forms that I have for some time been in the Comparisons of occurrence of iron ores in Ontario and Quebec. Relation of ore deposits to rock foldings and dislocations.

[27] Geological Survey of Canada 1874-5, pp. 112-22.

habit of directing prospectors to such points as those in which the strata folded over or under the axis of an anticlinal or synclinal, and so far many of the trials made at these points have been successful. Dislocations of the strata, or faults with their accompanying dykes and lodes, have also much to do with some of the larger deposits of iron ore."[28]

Harrington's Report on the Iron Ores of Canada.

A valuable report on the iron ores of the Dominion was made by Dr. Harrington of the Geological Survey in 1874, and published in the report of the Survey for that year. A summary of this report, in so far as it concerns the Province of Ontario, is presented below:

Origin of iron ores: chemical and mechanical concentration.

Referring to the origin of the iron ores, Dr. Harrington states that from the Laurentian days down to the present processes of chemical and mechanical concentration have been in operation which have resulted in the formation of beds and veins of ore. The processes have doubtless, he thinks, differed in kind to a certain extent, and they have operated under more or less favorable conditions; and subsequently to their deposition the ores have frequently been subjected to agencies which have deprived them of their original nature, so that it is not surprising to find them differing widely in chemical composition and physical characters. Three classes of ores are treated of in the report, viz., (1) anhydrous oxides, embracing magnetic iron ore or magnetite, hematite, including crystalline and earthy varieties, and titanic iron ore; (2) hydrous oxides, including limonite or brown hematite, and bog ore; and (3) carbonates, including spathic ore and clay ironstone. The last-named ore, it may be observed, has not yet been discovered in the older parts of Ontario, but a large bed of it has been noticed by Dr. Bell on the Mattagami river near latitude 50° 30′ north and longitude 82° west. The most important deposits of magnetic iron ore occur in rocks of Laurentian and Huronian age, but it is also found in rocks which have been referred to the Lower and Upper Silurian, as well as in the Devonian and Trias.

Veins and beds of magnetic ore.

There are few opportunities for studying the character of the Laurentian and Huronian magnetites in our country as compared with those afforded in Norway and Sweden, and also in New York and New Jersey; but Dr. Harrington observes that while the larger and more important deposits such as Big Ore bed in Belmont are interstratified beds true veins of magnetic iron ore also occur. Thus at the Foley mine in Bedford the country rock, which is a diorite showing little or no indication of bedding, is cut not only by the deposits of magnetite but also by veins of coarsely crystalline calcite, the two minerals being in some instances associated. In the undoubted beds the magnetite is generally granular or massive, but does not occur in large crystals of definite form. In New Jersey the workable deposits of magnetic ores are regarded as of sedimentary origin, though formerly believed to be eruptive. "The latter view was also taken by Sir Roderick Murchison as to the origin of some of the rich deposits of magnetite in the Urals, and many of the deposits of magnetite in Norway and Sweden have been considered as eruptive by Durocher and others. None of the Canadian magnetites, so far as I am aware, have ever been regarded as eruptive, at least by the officers of the Geological Survey." It will be found hereafter that this opinion has been held by at least one officer of the Survey.

Sedimentary magnetites.

On the origin of our sedimentary magnetites the question arises as to whether they were deposited as such, or in some other form and afterwards altered to magnetite. In some cases beds may have been formed by the accumulation of iron sands, as they are forming in the gulf of St. Lawrence today, the material being derived from the disintegration of pre-existing crystalline rocks, in which case they might be expected to contain not only

[28] Geological Survey of Canada, 1876-7, pp. 297.

magnetite but ilmenite; but Dr. Harrington thinks it probable that in general their origin has been similar to that of the modern bog and rock ores.

"Deposits of magnetite as a rule do not continue of uniform thickness for any great distance like the enclosing rocks, and this is just what might be expected if we suppose them to have originally occurred as bog or lake ores which accumulated in local hollows or depressions. No ore moreover would be more readily converted into magnetite than bog ore, on account of the considerable proportion of organic matter which the latter contains. In this connection may be described a very simple but interesting experiment tried with a specimen of bog ore from L'Islet containing about 22 per cent. of water and organic matter. The pulverized ore was placed in a platinum crucible and heated for an hour at a temperature of 190° F. At the end of that time it had parted with its combined water, or at any rate with sufficient to cause the color to change from brown to bright red. It still however retained organic matter, and on heating for a few minutes in a tightly closed crucible and at a temperature considerably below redness a reduction of the peroxide ensued and a black, strongly magnetic powder was obtained, apparently consisting of magnetic oxide and not of metallic iron, as it occasioned no precipitation of metallic copper in a solution of the sulphate. The cover was now removed from the crucible and a red heat given, when in a short time the powder again became red, or rather purplish-red, and non-magnetic. Finally the heat was raised a little higher (to bright redness), and soon the powder became black and strongly magnetic, having apparently parted with a portion of its oxygen. These changes are instructive, for while brought about in the laboratory they might take place in nature. They show too that in some cases magnetites may have been formed from such ores as bog ore at comparatively low temperatures, the reduction being due to the organic matter of the ore. That a magnetic oxide should be converted into a non-magnetic oxide, as described above, is a curious fact. It is generally stated also that peroxide of iron requires a white heat to convert it into magnetic oxide, but the heat of an ordinary Bunsen burner has been found to readily convert limonites, even when free from organic matter, into magnetic oxide."[29]

Harrington.

Conversion of bog ore into magnetite.

At the Hull mines on the east side of the Ottawa river the magnetite occurs in crystalline limestone containing graphite, mica and pyroxene, but the latter more rarely. At the Big Ore bed in Belmont the ore is interstrati-

Variations of occurrence.

[29] It is the opinion of Messrs. N. H. and H. V. Winchell of the Minnesota Geological Survey that similar changes have taken place in the iron ores of the Vermilion schists in that state in the same way, but upon a grand scale. "Magnetite," they say, "differs from hematite in having a greater ratio of iron to oxygen, and in its crystalline system. Magnetite is found in the primary eruptive basalts, where it is one of the essential characteristic minerals. By greater oxidation it is converted to hematite, which is frequent in the metamorphic rocks. When magnetite is found in the metamorphosed rocks it is generally at points and planes of contact with eruptive dykes whose pressure, heat and percolating hot solutions have concentrated the iron from surrounding rock masses. When it constitutes ores in the metamorphic rocks, as in the Vermilion series of schists, it is disseminated either as an ingredient of a massive basic rock, or it is interlaminated with siliceous sheets which are similar to those of 'chalcedonic' quartz in the jaspelite of the Keewatin schists. Structurally it repeats the characters of magnetite in the eruptive gabbro on the one hand, and of the hematites of the Keewatin on the other. It is necessary to consider therefore only the laminated condition, since the massive deposits can be referred directly to dynamic and thermal agents. These laminated deposits of magnetite are embraced sometimes in undoubtedly eruptive basic rock. The change therefore from hematite to magnetite through the action of heat and moisture seems to be one of the common phenomena of metamorphism." It is of the same general character as the authors' show to have taken place in other minerals of the Keewatin schists, viz.: "a step back toward the condition which the constituent iron molecules had when they were erupted with basic lava from the interior of the earth." (The Iron Ores of Minnesota, 1891, p. 21.) The iron ores found in the Vermilion series of rocks in Minnesota are magnetites, whereas by far the larger part of ores in the Mesabi range are hematites; but in his paper on the Mesabi Iron Range (1892) H. V. Winchell shows that in the eastern portion of it, near Gunflint lake on the Ontario boundary, the ore is magnetite and "probably owes its magnetic properties to the heat of the gabbro overflow upon the hematites which were deposited in the rocks at the time of their formation in the oceanic waters."

fied with diabase, greenish epidotic and chloritic rocks and crystalline limestone. At the Seymour bed in Madoc the ore is underlaid by a thin band of soft mica schist, and overlaid by reddish-gray highly felspathic rocks, in places porphyritic, and occasionally passing into syenite or syenitic gneiss. At the Chaffey mine the ore occurs in coarsely crystalline gneiss containing both mica and hornblende, the gneiss adjoining a band of crystalline limestone. On the Quinze river in northern Ontario, Mr. McOuat found magnetic iron ore interstratified with quartzite, the ore forming layers from the thickness of paper to about an inch, and interlaminated with similar layers of whitish-gray and dull red fine-grained quartzite. Here the iron ore constitutes probably from a fourth to a third of the whole, and as the thickness of the whole band is about thirty feet the total thickness of the layers of iron would probably be not less than eight feet. Dr. Harrington observes that some of the Michigan ores occur in an analogous manner, and are considered to be of Huronian age. Concerning the occurrence of iron ore in beds of diorite, as at the Foley mine, he says it is quite impossible to distinguish the rock from diorites of igneous origin, saving that it appears in general to follow the sinuosities of the beds on either side of it, and is sometimes seen to blend into hornblendic and micaceous schists. But the term "diorite" strictly speaking belongs to an igneous rock, and there seems to be no good name for a similar aggregate of a sedimentary origin. In Hastings and Addington, as well as elsewhere in Ontario, fine-grained diorites occur, but those which are associated with magnetic iron ore in the townships of Bathurst and South Sherbrooke in Lanark are generally coarse-grained, and often contain scales of dark-brown mica, grains of magnetic iron ore and small quantities of quartz These observations illustrate the variable character of the rocks adjoining deposits of magnetite in our old crystalline series, but while it is exceptional to find such deposits in limestone they frequently occur near the junction of other rocks with it. "This fact should always be kept in mind in tracing or searching for magnetites, as the limestone bands are continuous and constant in character for long distances."

A fact worth noting by explorers.

Following is a table of analyses of magnetites given by Dr. Harrington, the first four of which were made by Dr. Hunt and the fifth and sixth by Prof. Chapman.

Analyses of Ontario magnetites.

	I.	II.	III.	IV.	V.	VI.
Peroxide of iron	69.77	90.14	72.80	89.22	58.35	59.39
Protoxide of iron	.....	.....	.....	.....	24.87	26.93
Oxide of manganese	.....	traces	.....	none	0.13	traces
Alumina	5.65	1.33	.....	.....	0.42	0.67
Lime	.....	0.82	1.69	none	1.43	0.33
Magnesia	4.50	0.84	6.86	.....	2.56	0.82
Phosphorus	0.085	0.007	0.035	0.012	0.07	traces
Sulphur	1.52	0.12	0.027	0.073	0.04	0.07
Carbonic acid	.....	.....	1.50	.....	.....	.....
Silica	7.10	.....	.....	.....	11.17	.....
Titanic acid	9.80	1.03	.....	.....	0.73	3.23
Graphite	.....	.....	.....	.....	.....	.....
Water	2.45	.....	3.50	.....	.....	.....
Insoluble matter	.....	5.25	14.73	10.42	.....	8.38*
Totals	100.875	99.537	101.142	99.77	99.77	99.82
Metallic iron	50.52	65.27	52.72	64.61	60.19	62.52

*Silica and insoluble rock matter.

In this table the first column represents the Chaffey mine in South Crosby, the second Hon. George W. Allan's mine in North Crosby, the third the

Sand-pit bed of Belmont at Blairton, the fourth the Seymour mine in Madoc, the fifth the deposit on lot 20 in the first concession of Snowdon, and the sixth a deposit on lot 29 in the first concession of Bedford.

Varieties of hematite ores

Under the name of hematites are included several varieties of ore consisting of the anhydrous peroxide of iron; crystalline varieties with metallic lustre are either specular or micaceous; while the earthy varieties, often containing clay, are known as red ochre, and between the crystalline and the ochrous ores comes red hematite. As a rule hematite is freer from impurities than magnetite. It is not so easily reduced as hydrated oxides or carbonates, and is liable to produce gray rather than white iron, a fact of importance in connection with the manufacture of Bessemer pig. "Hematite occurs in both beds and veins, the beds generally, though not always, being the more important deposits. Like magnetite it is not found solely in any one kind of rock, but often in rocks of most diverse characters. A few examples illustrative of this fact may be of interest. Beginning with the Laurentian, we find at the McNab mine near Arnprior a compact red hematite occurring in crystalline limestone. The bed is inclined at a high angle and has been worked to a depth of about eighty feet, when it is said to have thinned out. At the Dalhousie mine, twelve miles from Perth, a compact red hematite somewhat similar to the McNab ore also occurs in limestone, although at one point in the workings a soft chloritic looking slate with numerous crystals of pyrites seems to intervene between the ore and the underlying limestone. The limestone is highly crystalline; that underlying the main deposit being white and containing large quantities of tremolite, while that which overlies it is stained red with peroxide of iron. When the mine was opened up there appeared to be two beds cropping out in places at the surface with four or five feet of limestone between them. The uppermost and smaller of these was found to run out at a few feet in depth, and to extend but a short distance in the direction of the strike. The larger deposit was in places as much as nine feet thick at the surface, and at a depth of eighty feet had an average thickness of four or five feet. Among other examples of the occurrence of hematite in Laurentian limestone may be mentioned the thin vein of specular ore on lot two, range four of Elzevir (Geology of Canada, 1866, p. 101), and the finely-granular hematite of Iron island, lake Nipissing." No important deposits of hematite have yet been discovered in our Huronian rocks, like those of Michigan, but where they have been found they are very similar in the mode of occurrence, consisting for the most part of alternate layers of compact hematite or specular ore and quartzite or jasper, in dioritic or diabasic rocks. In the following table are given analyses of several ores from different mines in Ontario:

Harrington.

Occurrence of hematite.

	I.	II.	III.	IV.
Peroxide of iron	84.42	84.10	82.25	86.80
Protoxide of manganese	...	...	...	...
Alumina	...	...	...	...
Lime	3.02	4.93	trace	none
Magnesia	0.50	...	...	...
Phosphoric acid	0.03*	...	0.026*	trace
Sulphur	0.065	...	...	0.092
Carbonic acid	2.93	3.87	...	...
Silica	...	4.00	...	...
Titanic acid	...	...	...	...
Graphite	...	...	...	...
Water	...	...	0.66	...
Insoluble matter	7.160	...	16.05	12.75
Totals	98.125	96.90	98.986	99.642
Metallic iron	59.09	58.80	57.60	60.76

*Phosphorus.

The first is from the McNab mine near Arnprior, the second from the same locality, the third from the Dalhousie mine, and the fourth from Gros Cap on lake Superior.

Workings of Ontario mines.

Referring to the production of several mines in Ontario, Dr. Harrington says the Blairton or Big Ore bed of Belmont was in 1872-3 the largest in the country, the output for that fiscal year amounting to nearly 30,000 tons. In July of 1873 ore was shipped to Pittsburgh at the rate of 300 to 400 tons a day. The Yankee and Chaffey mines together had for several years been producing between 7,000 and 8,000 tons, and were the demand for titaniferous ores greater the production of these two mines could readily be increased. From the Dalhousie mine 3,000 to 4,000 tons had been annually raised and shipped for several years, but although the ore was one of the finest in the country the work had recently been stopped at this mine owing to the dulness of the market. Several hundred tons of very fine ore had also been taken out of the Fournier mine in South Sherbrooke during the winter of 1872-3.[30]

Coste's Views on Occurrence of Ores in Archæan Rocks.

Report on the Madoc and Marmora region.

Reference has been made to the views of Mr. Eugene Coste on the mode of occurrence of iron ores in the Archæan rocks, differing essentially from the views of other officers of the Geological Survey. Mr. Coste's report on the Madoc and Marmora region, in which he proposed to treat in detail of the metamorphosed primitive rocks and "to establish and explain the nature and relations of the deposits of iron ore and of the auriferous mispickel and quartz veins, with the granitic and dioritic igneous masses,"[31] has not yet been published; but the following extract from the report of 1887-8 presents a summary of his conclusions:

Coste.

"The object of this paper is to present in a concise form the conclusions arrived at by the writer as to the mode of occurrence of the iron ores and phosphate deposits in the Archæan rocks of Canada after a careful and minute study of many of these deposits in the iron and phosphate districts of Ontario* and in the counties of Ottawa and Pontiac in Quebec. It is here presented on account of the practical bearing that it may have on the future developments of these important deposits, as it is hoped that it will be found to be a strong encouragement for the working of many of these deposits in depth as well as a guide in the following of their irregular structure and a help in the further discovery of new deposits of these minerals. We think we may say that our conclusions will be found to be greatly at variance with the views generally admitted here in Canada, expressions of which have been published principally in the different reports of the Geological Survey, and especially in the Geology of Canada, 1863, and in the well-known subsequent reports of Dr. Hunt, Dr. Harrington and H. G. Vennor. For indeed we believe that we have gathered year after year strong and clear evidence to show that not only our deposits of iron ores in the Archæan rocks are of an eruptive or igneous origin, but also that our deposits of phosphate are exactly similar and have also the same origin. This is why we are treating here of the deposits of these two minerals together as we believe that they are exactly analogous, and that which can be said for one is applicable to the other. As far as the iron ores are concerned, the view of their deposits in the Archæan rocks being of an eruptive origin is far from being a new one, and has been held by a great many eminent geologists in many countries, principally I believe in France, Norway and Sweden, and also by some of the English and American geologists. In the case of the phosphate (apatite) the

Eruptive origin of iron ores and phosphate in the Archæan rocks.

[30] Geological Survey of Canada, 1873-4, pp. 192-259.

[31] Geological Survey of Canada 1886, p. 20A.

*Counties of Haliburton, Victoria, Peterborough, Hastings, Frontenac, Leeds, Lanark and Renfrew.

eruptive or igneous origin has also been advanced in Norway and in France, but by a smaller number of observers, probably on account of the fact that the apatite deposits are not so numerous as those of iron ores, and thus the opportunities for examination and report were less frequent. Here in Canada this eruptive origin of the apatite as well as of the iron ores has always been denied so far; and if my conclusions were not backed by so many facts, some of which were only brought to light in the workings of the mines in the last few years, I would feel somewhat reluctant to go thus entirely against the views already arrived at in this country by several very able men, but these facts were repeatedly observed and have been very carefully ascertained. The principal among these observed points are the following:

Coste.

Observation of facts to support the theory of eruptive or igneous origin.

"1. About thirty different deposits of iron ores (principally magnetite, though sometimes hematite) have been geologically surveyed by us* in the Madoc and Marmora region of Ontario, and were found to occur in the form of irregular veins around and always in close proximity to a large granite mass, or to dykes and bosses of granite derived from it. The granite intrusions clearly cut across the Archæan crystalline limestone and schists, and the deposits of iron ores are also manifestly veins cutting in a like manner across the Archæan rocks.

"2. Away from the main granitic bodies, in the region covered by the map above referred to, there are no large deposits of iron ore, and when small quantities occur there can be seen almost in every case a small dyke of granite along the iron ore; so that the intimate connection of the two cannot be doubted.

"3. An exactly similar connection was also observed between the iron ore deposits and intrusive igneous masses in a more extended region of several thousand square miles, also geologically surveyed by us,† and comprising parts of the counties of Hastings, Peterborough and Victoria, in Ontario. There the iron ore deposits such as those forming the Blairton mine, Orton mine, Baker mine, Emily mine, Coe Hill mine, Jenkins mine, the Snowdon mines, etc., were always found to be intimately connected in the manner described above with many varied kinds of igneous rock, such as granite, granulite, pegmatite, mica syenite, hornblende syenite, diorites and diabases.

"4. In the region north of Kingston, in the counties of Frontenac, Leeds, Lanark, Renfrew, Pontiac and Ottawa, many deposits of iron ores and many deposits of phosphate were observed also in the same association with igneous rocks, and both cutting through the Archæan rocks. In the case of the phosphate the igneous rock was often the rock termed by Dr. Hunt 'pyroxenite,' but at other times it was a pegmatite or a mica syenite or a pyroxene syenite. In that region the iron ore and the phosphate have been found in the same deposits, as witnessed by the evidence at the Foley mine, the Forsyth mine, and especially at the Blessington mines, where the writer observed the apatite and the magnetite together in the workings of nine different pits, and where at the time of his examination last summer there were between 500 and 600 tons of iron ore and about 1,500 tons of phosphate on the dumps, the two minerals having been taken out from the same pits.

"5. In the two regions mentioned above, the apatite and magnetite were often seen to be amongst the component elements of these masses or dykes of

*This map on the scale of forty chains to one inch, and comprising an area of one hundred and twenty-five square miles, is now in the hands of the engraver and is expected to be ready shortly. It will be accompanied by a report in which the details of our observations will be given at length.

†A map of about 3,500 square miles covering this region has been prepared and is expected to be published at the scale of four miles to the inch in the course of a year or so.

Coste.

igneous rocks, which rocks were observed to accompany these minerals in their deposits as a veinstone of quartz or calcite carries other minerals in other veins.

The ore deposits consequently of deep-seated origin.

"Considering all this, and knowing that similar facts have also been observed in other countries, especially in the states of New York and New Jersey, and in Norway and Sweden, it is only natural that we should conclude, like many other geologists have done before in those countries, that the iron ore and phosphate to be found in our Archæan rocks are the result of emanations which have accompanied or immediately followed the intrusions through these rocks of many varied kinds of igneous rocks which are no doubt the equivalent of the volcanic rocks of to-day. These deposits then are of a deep-seated origin, and consequently the fears entertained principally by our phosphate miners that their deposits are mere surface pockets, are not well founded. These fears are no doubt partly the result of the belief which has been somewhat prevalent that the apatite in them was the metamorphic equivalent of the phosphate nodules of younger formations, and it may be also that they have resulted from the fact that the apatite is irregularly distributed in these deposits and is often suddenly replaced by rock; this is not so often the case in the iron ore deposits which are on a larger scale. But notwithstanding this, when the deposits are properly understood to be, as we hold they are, igneous dykes and veins accompanying the igneous rocks, it will be easily seen why in the deposit itself the economic minerals can be suddenly replaced by rocks which may be said to be nothing else but the gangue. If this origin is understood it will besides facilitate and encourage the working of these deposits in depth, because the accompanying igneous rock forming a mass or a dyke alongside the deposit will be easy to follow, and, because if it is apatite or iron-bearing at the surface, it will always be a guarantee that it will also be in depth, as each separate mass of igneous rock is generally quite constant in composition."[32]

Iron Mines in Eastern Ontario.

Iron mines along the Kingston and Pembroke Railway.

The construction of the Kingston and Pembroke Railway had for one of its chief objects the affording of facilities to open up and work some of the iron ore deposits in the counties of Frontenac and Lanark, to which reference has been made in the foregoing pages. The deposits in the region of this railway are usually found in belts running in a northeast and southwest direction, parallel with the strike of the formations. The largest deposits are almost always found where the limestone and granite, gneiss or syenite come into contact, and this is largely true also of the iron ores in districts north and northwest of lake Superior. Magnetic ore is the principal variety, but specular ore has been discovered in several localities. Mr. William Rattle, an American mining engineer, who explored the district a few years ago, stated to the Mining Commission that he had found specular ore in several localities on a range in Darling. In one place he was shown a vein of magnetite 35 feet in width, and in another a bed of hematite at least 15 feet in width which he had traced 200 feet. Messrs. Bawden, Folger and Grady gave particulars to the Commission of the working of various mines along the line of the railway, of which the following is a brief summary:

Glendower mine.

The Glendower mine in Bedford is four miles east of the railway line, and is connected with it by a branch built in 1884. A large plant was erected and work was carried on upon an extensive scale for four or five years. The ore is magnetic, and runs from 50 to 60 per cent. of metallic iron. Near the surface it was clean and of fine quality, but at a depth of 120 or 130 feet it was found to contain sulphur, and operations were discontinued. At the bottom of the shaft the vein was 20 to 40 feet wide, the ore averaged 60

[32] Geological survey of Canada, 1887-8, pp. 62-4s.

per cent. and the mine was in a position for raising 400 to 500 tons per day. Two or three other openings were made in the same locality, and numerous deposits are known to exist there. A bed of red hematite on lot 2 in the seventh concession has a width of 40 feet.

Mississippi mine.

North of the Mississippi river several locations have been worked in the township of Lavant. From one of these, the Mississippi mine, between 30,000 and 40,000 tons were taken out and shipped to Pennsylvania.

Wilbur mine.

The Wilbur mine in Palmerston lies between two bands of crystalline limestone, and about 100,000 tons of ore was taken out of the several shafts on the property. It was free from sulphur and phosphorus, and averaged about 50 per cent. of metallic iron, some analyses going up to 68 per cent.

At Calabogie lake.

Near Calabogie lake two shafts have been sunk and considerable quantities of ore have been raised, but it is said to have too much phosphorus for Bessemer iron.

The drop in the price of iron ore in United States markets which occurred while these mines were being opened led to the closing of the works, and scarcely any attempt has since been made to prove new locations or even to prospect for ore.

Iron ores on the line of the Central Ontario Railway.

In the county of Hastings the Central Ontario Railway was built at a cost of $2,000,000 to connect iron locations in the northern part of that county with lake navigation at Trenton. A large deposit of magnetic ore at Coe Hill in Wollaston was opened and worked for some time, as related in the statement of Mr. Ritchie, but for reasons mentioned by Mr. Ritchie operations were discontinued there. Prospectors report the existence of numerous and large deposits of ore in localities near to this line of railway and northward of its terminus, but no work has been done upon them to prove their extent or quality.

Belmont Bessemer Co.'s mine in Belmont.

A promising show of magnetic ore occurs on lot nineteen in the first concession of Belmont, the property of Mr Ledyard of Toronto. It was leased in 1891 to the Belmont Bessemer Ore Co., and a railway is being constructed to the property. The deposit is said to range from 20 to 150 feet in width, and test borings have been made to depths ranging from 30 to 100 feet. The superintendent, Mr. Woodworth, informs me that little work was done last year owing to the depressed condition of the ore market, but numerous samples have been analyzed. The average of twenty-three samples made for the company gives the following result:

Metallic iron	65. 333
Phosphorus	. 016
Sulphur	.0747
Silica	4. 303
Titanium	. 743

This includes a lot of 100 tons sent to the Cambria Iron Co. of Pennsylvania, which gave 61.08 iron, .0225 phosphorus, .497 sulphur and 7.84 silica. A fifty-foot drift has been driven from a shaft at a depth of 40 feet, partly in ore and partly in what seems to be the foot wall. The mine is provided with steam boiler pumps, drill, hoist and suitable buildings, and can be put into good condition for shipping ore as soon as the railway is completed. This road is 9½ miles in length, and connects with the Central Ontario Railway two miles south of Marmora village. A further account of this mine is given in the statement of Mr. Ledyard, made to the Bureau as follows:

Ledyard.

"I am a dealer in mines, more particularly iron, and have been engaged in the business for twenty years more or less. I own the Belmont mine, which is leased to the Belmont Bessemer Ore Company of New York. They are not actually working the property at present; but they have done sufficient development work to warrant them in building a railway into it, and they say they expect to have this railway completed next spring. So far as the

The Belmont mine.

Ledyard.

extent of the deposit of ore is concerned the development which I did on the property showed a needle attraction of 600 feet in length by about 400 feet in width in some places; the company claim to have found a considerably greater length. I sank prospecting pits; the company have put down shafts; they have one 50 feet in depth which showed ore all the way. They have had diamond drilling done to a depth of about 100 feet. At 90 feet in No. 1 drill hole the ore was wonderfully pure, running very high in iron and almost absolutely free from impurities—not a sign of sulphur. The ore was particularly good at 90 feet, but it varied as all magnetic deposits do in its mixture with rock. This company propose to work the property and export the ore to furnaces in Pennsylvania. They have their buildings erected and all their hoisting machinery and other plant prepared to go to work. Within a month's time they could probably have the railway finished and be at work if the market warranted. The low price of ore has kept them back, otherwise they would have been at work last year. The analysis of this ore shows it to be very similar to the Lake Angeline and Pittsburgh Mining Company's ore, which is the very highest grade. This ore comes from Marquette district, in the state of Michigan. Both myself and the company have had analyses of the ore made. Following are some of these:

Extent and quality of the ore.

Analyses.

Assayer.	Locality.	Iron.	Phos.	Sulph.	Silica.	Tit. Ac.
Molin	East Pit	70.326	.0056	.0023	.875	.000
"	North "	55.240	.019	.0000	11.200	.000
"	South "	60.376	.037	.007	.000	.000
"	Shaft No. 1	63.131	.023	.004	.000	.000
Scranton	No. 1	65.36	.005	.000	4.50	.000
Cambria	N. & S. Pit	68.83	.008	.000	1.96	.06
"	"	69.99	.012	.000	3.10	.15
S. of S., Toronto	Surface	64.26	.000	.040	.000	.000
Fisher	South Pit	68.88	.006	.000	3.18	.000
"	East Pit	69.85	.013	.012	.000	.000
Ledoux	Var. places	66.55	.013	.096	2.43	.000
"	No. 3 Pit	69.85	.013	.012	.000	.000
"	No. 2 Pit	68.33	.016	.037	.000	.000
Molin	East Pit	69.630	.003	.005	.....	.000
"	No Pit	62.667	.013	.384	.....	.000
.....	Drain Hole 1, 75ft	60.376	.004	.002	.....	.083
.....	" 70ft	65.104	.005	.074	3.83	.004
Pa. Steel Co	100-765 sample	68.950	.007	.000	4.12	.....
Cambria Iron Co	100 tons	60.401	.022	.497	.....	.....
"	"	61.76	.023	.....	7.84	.....
Molin	.....	67.309	.007	.130	.....	.....
"	.....	69.630	.007	.158	.....	.....
"	.....	71.951	.003	.041	.....	.....

"A number of analyses have been made by Mr. Molin of 20 Liberty street, New York, a well known Swedish expert. He has an article in the Engineering and Mining Journal of November 19th, 1892, in which he gives his opinion of this ore. The average of the samples he analyzed shows metallic iron 65.1 per cent., phosphorus .005, sulphur .074, titanic acid .04. The company state that an ordinary analysis shows no titanium at all, and that it is only by a very delicate test that it can be detected. The ore is a remarkably soft, fine ore. You will see what Mr. Molin says as to the suitability of the ore for making not ordinary Bessemer, but the very finest grades of steel. The phosphorus, as you will observe, is only .005 per cent. This property is in Peterborough, immediately adjoining Hastings county, hardly seven miles from Marmora village.

Iron ore properties in Snowdon.

"I have also some iron properties in the township of Snowdon, in Haliburton, consisting of lots 25 and 27 and 30 and 31 in the fourth

concession. These I have developed by sinking shafts on them to some extent. Lot 26 belongs to Mr. Howland, and the Howland mine is situated on it. There are one or two other places in that neighborhood which show promising signs of ore, but it is doubtful if it is present in large quantity. There is also the Paxton mine in Lutterworth, out of which about 1,000 tons of beautiful ore was taken. This is in the section of country with which I am most familiar. Experts say that the formation in Snowdon is just the right formation for iron ore in quantity, and that from what they can see there is sufficient ore there to warrant mining on an extensive scale. Ledyard.

Howland and Paxton mines.

"I should think a smelting furnace in Toronto could very profitably use these ores, but hematite would be required to mix with them. It is not quite so clear where the supply of hematite could be got. I found some in Belmont, which looks promising, but there has not been sufficient development to prove the quantity; it is just south of the magnetic deposit which the Belmont Bessemer Company is working."

Extensive ranges of magnetic ore extend from the township of Snowdon in an easterly direction across Haliburton, Hastings and Addington into Frontenac. Mr. Pusey, whose statement is given below, describes the ranges as running parallel to each other at an average distance of ten miles, and at intervals the ore occurs in large bodies and generally of good quality; but in one locality where the mass is very great it bears a high per cent. of titanium. In an interview Mr. Pusey gave the following information to the Bureau:

Iron belts extending from Haliburton to Frontenac.

"I am manager of the Bancroft Iron Company; we are building a railway from a point near Kinmount on the Victoria branch of the Midland Railway eastward through the townships of Snowdon, Glamorgan, Monmouth, Cardiff, Faraday and Dungannon. East of the last named township we have not yet located the line, but explorations have been made recently which prove that large and rich bodies of ore exist in Barrie, Clarendon and Frontenac. Our object in building this road is to develop the mineral interests in that section of the Province. We have ten miles completed and in operation, and ten miles more ready for laying the rails, which will be put down early in the spring. The road leads to some very valuable iron deposits in the townships of Glamorgan and Monmouth; the iron ore there occurs in two distinct ranges running in a northeast and southwest direction, which at their western ends are about ten miles apart, but approach each other and are almost merged into one range in the township of Dungannon in the county of Hastings. There is more crystalline limestone found in the southern range than in the northern one; in the latter there is more of a red syenite. The ores of the north range are much richer than those of the south range, but both are magnetic. There is very little hematite or indication of hematite in the north range, but indications of this variety of ore exist on the south range. Outcroppings of ore are found along both ranges: there are barren stretches and then numerous deposits of ore, seemingly clustered. So far as we have explored the north range it appears to be about one mile in width, but the width varies: we have never explored north of a certain line, the line forming the southern boundary of the nine townships belonging to the Canada Land and Emigration Company. The south range will vary from five to ten miles in width. You will find the same class of ore over five miles south of our deposits, but we have never explored very much south of say a mile in width through that section. We have found outcroppings of ore at frequent intervals on both ranges through the townships of Glamorgan, Monmouth, Cardiff, Faraday and Dungannon, a total distance of say fifty miles. We have explored by sinking test pits or shafts at seven or eight different points on the north range within the fifty miles. We have found the ore to be very rich; all the analyses show 70 per cent., not varying more

Pusey.

Construction of a railway to open up iron ore locations.

A double belt 50 miles long.

Pusey.

than one per cent. in any case. Following are analyses of three samples of ore from the north range :

Analyses of ores in north range.

——	1	2	3
Sesquioxide of iron	67.14	67.27	
Protoxide of iron	30.06	30.08	
Phosphorus	faint trace .	trace.	faint trace .
Sulphur	trace.	trace.	
Titanium	none.	none.	
Rock matter	2.74	2.58	
Metallic iron	70.38	70.50	69.77

Deposit No. 1 is on lot 27 in concession 15 of Glamorgan. Deposit No. 2 is in the eastern part of Monmouth ; I do not know the number of the lot, but the two are ten miles apart and are taken from the solid lode, no float pieces. Deposit No. 3 was analyzed for iron and phosphorus only, and is situated twenty miles further east than No. 2. We have other deposits of similar ore in the north range ; there is one situated between the extreme east and No. 2 in the township of Cardiff, containing 68.27 of metallic iron. Following are analyses of samples from the south range :

Analyses of ores in south range.

——	1	2	3
Metallic iron	59.5	60.00	45.82
Phosphorus		.02	.02
Sulphur	.05	Trace.	

No. 1 belongs to Mr. Shortiss and his associates, and is known as the Victoria mine. It was worked by our company at one time. The average ore would run from 58 to 61 per cent. : but there was some as low as 48 and 50. No. 2, known as the Howland mine, is situated east of the Victoria mine in Snowdon township. There is one peculiarity about it which would apply almost as well to the Victoria mine, viz., the large amount of lime, 4.12 per cent., which it carries. It has also 2.72 of magnesia and .30 of alumina. All the sesubstances come in for fluxing, and answer very well for that purpose. The Imperial mine, No. 3, is also situated in the township of Snowdon. It yields a low grade ore, but one very free from impurities. I call it a hematite mine, but I think it will turn out to be more of a specular iron than a hematite.

Victoria, Howland and Imperial mines.

" I think I should say a word about a very large deposit of titanic iron ore on lot 35 in the fourth concession of Glamorgan, known as Pine Lake mine. It has been explored by test pits at many different points which show a solid ledge half a mile in length by 100 to 200 feet in width. It forms a high ridge, and at one point crossed by a ravine there is an exposure of ore to a depth of 80 feet. It is a magnetic ore, containing 53½ per cent. of metallic iron, .017 of phosphorus and about 10 of titanium. This excess of titanium makes the ore useless according to present furnace practice, but recent experiments give good reason for hope that the titanium difficulty can be overcome with suitable flux. And it is well known that titanium in iron is not in itself objectionable ; on the contrary, it adds to the strength and ductility of iron. The Pine Lake mine however is the only one in the two parallel ranges of fifty miles in length which shows titanium in hurtful quantity. There is also only one mine in these ranges in which

Pine Lake mine.

phosphorus is in excess of the Bessemar limit. Where ore is shown to exist at so many points along the two ranges, and visible by outcroppings in large quantity, I think there need be no fear for the supply." Pusey.

Ores in Northern Ontario.

The principal area of the Archæan rocks of the Province is in the region north of the great lakes, lying between Ottawa river on the east and Lake-of-the-Woods on the west. There is good reason for believing that this territory is rich in minerals, and many valuable discoveries have already been made in it, although on account of its great extent it has been but very imperfectly explored. Iron ore has been discovered in numerous localities, east and west, but mostly in association with the Huronian rocks, and some of the deposits are known to be very large, and the quality of the ore is claimed to be very good. During recent years however there has been no inducement to explore the country for iron, and little progress has been made in our knowledge of its occurrence, saving in two or three localities beyond lake Superior. Iron ores in the region north of the great lakes.

Iron island in lake Nipissing is composed of crystalline limestone interstratified with and cut across by trap. Small masses of specular iron ore, Mr. Murray stated in his report for 1854, are common to most of the rock in this island, but in the crystalline limestone there is a large display of it. For a breadth of about forty yards along the cliff on the east side the rock yields masses of ore of various sizes, sometimes in strings of an inch thick or upwards, and at other times in huge blocks of half a ton weight. The beach near this outcrop is strewed with masses of all sizes from several hundred pounds to small rounded pebbles not larger than marbles. Crystalline limestone also crops out on the west side of the island, which appears to correspond with that holding the iron ore on the east. The same minerals are found disseminated through the rock and strewed upon the beach. At the southwest point of the island the rock is again limestone, and a long beach running out from it to the westward is covered with boulders of specular iron ore. Iron ore also occurs at the southeast of the island, but not in such great abundance, and only in detached masses strewed upon the beach.[33] Specular ore in lake Nipissing.

In the report of the survey for 1848-9 Mr. Alexander Murray refers to the discovery of a vein of specular iron ore in the La Cloche mountains along the north shore of Georgian bay, on the Wallace mine location, "cutting the strata in a north and south direction with a width of 15 feet." Specimens of the ore from this vein were presented to Mr. Murray by Mr. Bristol, but he states that he had not an opportunity of visiting the locality. On analysis by Dr. Sterry Hunt the ore was found to contain 68.6 per cent. of metallic iron. The lode, Mr. Murray says, would yield 20 tons of metallic iron per cubic fathom, or at a breadth of 12 feet 40 tons for every fathom forward by a fathom vertical.[34] Specular ore in the La Cloche mountains. Wallace mine location.

It is shown by more recent examination however that the vein is not so large as was reported to Mr. Murray. The report of the Mining Commission describes it as consisting of about 8 feet of banded ore and quartzite, the ore varying from crystalline to compact specular. "The bed or vein may be traced some 200 or 300 yards westward and is about two feet in width where last visible." Eastward it is covered by a mass of *debris*. Mr. Thomas Frood, who is part owner of the location, described the ore as of steel color, slightly magnetic, and part of it as red and very soft. "The vein is visible for about 200 yards; at the west end on the face it is about six inches wide:

[33]Geological Survey of Canada, 1853-6, p. 123.
[34]Geological Survey of Canada, 1848-9 p. 45.

at the east end where the pit has been sunk, the width of the vein is about 8 feet. The depth of the pit is about 20 feet and the vein seems to increase in width and the ore to improve in quality as we go down.[35]

Other occurrences.

South of the Wallace mine location and three miles northwest of Killarney, on a peninsula of grayish Huronian quartzite, Dr. Bell says there is a promising deposit of magnetic ore.[36] Explorers also report a fine occurrence of iron ore from this peninsula westward towards La Cloche island and eastward into the township of Rutherford.

Specular ore near Echo lake.

In describing the geology of the Huronian formation in the vicinity of Echo lake, Mr. Murray states that specular iron ore was frequently observed both in the trap and in the sedimentary portion of the formation, occasionally arranged in thin, continuous layers between the strata for considerable distances, and at other times in small isolated masses irregularly distributed through the rock. The latter condition, he states, was especially observed in the quartzose conglomerates with blood-red jaspers, where indeed the iron ore appeared to constitute a characteristic mineral.[37] Mr. R. E. Baily described to the Mining Commission a deposit of specular ore which he had discovered about three and a half miles northeast of Echo lake, and which had a width of 15 or 20 feet. Openings had been made upon it at six or seven places by which it had been traced for about 1,400 feet. The ore was shown by analysis to contain 65 per cent. of metallic iron, and to be very free from phosphorus and sulphur. Other discoveries are also reported in the same region.

A hematite mine at Desert lake, in Coffin.

In the township of Coffin James Stobie developed a location in 1874, and worked it three or four years. The width of the vein, Mr. Stobie stated to the Mining Commission, was from two to eleven feet, and the ore could be traced for a length of two miles. It was a hematite ore of good quality, and for three seasons it was shipped to Detroit. The location is at Desert lake, ten miles northwest of Bruce mines.[38]

On the east coast of lake Superior.

In 1865 Mr. Macfarlane made an exploration of the east shore of lake Superior, where the formations are largely the same as in the northern peninsula of Michigan. He observes that as the great beds of red hematite which occur at Marquette belong to the Huronian series of rocks, it ought to be matter for congratulation that the same ore has been found to characterize the same rocks on the Canadian shore. Discoveries of hematite had been made at Batchawana bay and Gros Cap, and "although neither of these so far as yet opened can compare in richness with the Marquette deposits, it cannot be doubted that future explorations, if vigorously pursued, will quickly develop iron mines on the north shore equally remunerative as those on the American side." The Batchawana ore bed is about seven miles to the northwest of the village of that name. The ore is principally specular iron, the less compact hematite being comparatively rare. There is also an admixture of magnetite, and both ores in narrow bands are interbedded with smaller bands of dark red jasper. The thickness of the banded bed is not less than twenty feet, and in some places cannot be less than forty. The deposit on Gros Cap presents more promising features where it overlies a bed of greenstone slate, and seems to occupy a valley running northwestward between higher rocks. The total thickness of the ore-bearing bed is about sixty feet, but the upper part is very poor, containing merely finely-disseminated ore. Various other beds were observed in the same locality cropping out upon the lake shore.[39]

Batchawana ore bed.

Gros Cap deposit.

Dr. Bell visited Gros Cap eleven years afterwards, and refers in his report

[35] Report of the Commission, pp. 123 and 143.
[36] Geological Survey of Canada, 1876-7 p. 210
[37] Geological Survey of Canada, 1857, p. 24.
[38] Mining Commission's Report, p. 143.
[39] Geological Survey of Canada, 1863-6, pp. 129-31.

to two exposures of hematite on the southern part of the cape. One of these is fifteen or twenty feet of very impure purplish red hematite, interstratified with thin, drusy, gray, silicious beds, the band dipping south 30° west at an angle of 70°. The second is near the southwest extremity of the cape and had been worked several years previously. It is about twenty feet in thickness, consisting of thin and very distinct and regular ferruginous beds. "The best layers appear to be a sufficiently rich iron ore, but it is questionable whether the earthy beds do not form two large a proportion to make it profitable to mine the whole mass in order to obtain them."[40]

Ores North and West of Lake Superior.

North of lake Superior.

An exploration survey of the country north of lake Superior between the Nipigon and Michipicoten rivers was made by Robert Bell during the years 1869-70, and in his report reference is made to the occurrence of thick beds or veins of magnetic iron ore in massive crystalline granitoid rock of red orthoclase and black hornblende at the mouth of the Little Pic river. The ore occupies a horizontal position in a cliff, and the united thickness of three of the beds appears to be about ninety feet. One sample of this ore yielded 36 per cent. of metallic iron, and another from a different part of the deposit 46 per cent. A band of impure solid hematite ore was also found on the west point of the largest of the Slate islands, and a silicious slaty magnetic ore was found to occur as a band two feet in thickness on the portage at the west end of Little Long lake.[41] William Murdoch, civil engineer of Port Arthur, informed the Mining Commission that he had sold an interest in a very large deposit near Loon lake where there is said to be a million tons of ore in sight. On Ruby lake also he stated that there is a deposit of hematite which will go 65 per cent.[42]

Ores on Loon and Ruby lakes.

The two great iron ranges of Minnesota, the Vermilion and Mesabi, have been traced northeastward into Ontario. The Vermilion enters our Province at the eastern end of Hunter's island, and numerous outcroppings have been discovered on the range across that island.[43] Prospectors also report the appearance of ore at a number of places inland, and although careful exploration has not been made it is probable that the ore deposits on the Mattawan river are on the continuation of the Vermilion belt. In the report of the Mining Commission Michael O'Keefe of Tower, Minn., is credited with saying that he had explored Hunter's island north of Emerald lake and traced a deposit of iron ore a total distance of eight miles, the width of which varied from 50 to 300 feet. James Sheridan also informed the Commission that he had explored Ontario on the north side of Knife lake, on the east of Hunter's island, and took up an iron location there. He described the ore as a hard red hematite mixed with jasper, like the Vermilion, and lying between walls of diorite and chloritic slates. The deposit is 90 feet wide, and the bed can be traced for three miles along the strike. Assays of the ore showed it to run from 47 to 56 per cent. of iron, and Mr. Sheridan thought that it would average about 50 per cent.[44]

The Vermilion and Mesabi iron ranges of Minnesota extend into Ontario.

On Hunter's island and Knife lake.

The Mesabi range has been carefully explored during the last three years by Mr. H. N. Winchell of the Minnesota Geological Survey, and a valuable report by him has recently been published upon it. This range lies at the base of the Animikie formation, and has been traced northeastward into Ontario, crossing the boundary at Gunflint lake and curving around to the

Features of the Mesabi range.

[40] Geological Survey of Canada, 1876-7, p. 220.

[41] Geological Survey of Canada, 1870-1, pp. 347-8.

[42] Report of the Commission, p. 144.

[43] "Hunter's island is interesting economically chiefly for the iron ores associated with jaspery beds which occur on its southeast side, and which are entirely analogous geologically to the famous iron ores of Vermilion lake at Tower, Minnesota." Geological Survey of Canada, 1888-9, p. 27A.

[44] Report of the Commission, pp. 125-6.

head of Thunder bay, east of Port Arthur. It is an iron-bearing belt over a large portion of its length, but the ore varies in richness, and in many stretches the range is lean or altogether barren, as indeed is the case with almost every known iron belt of considerable length. West of the Duluth and Iron Range Railway the ore is found under deposits of clay and gravel, and when uncovered it may be scooped out and loaded on to cars with a steam shovel, being almost of the consistence of fine sand. It is of the hematite variety and of different colors and shades of colors, red, blue and brown. East of the Iron Range Railway the ore beds are covered by strata of black slate, or of an eruptive rock called gabbro which was poured out over them like volcanic lava. The effect of this overflow of molten rock, in the opinion of Mr. Winchell, was to convert the hematite into a magnetic ore. In the northern part of the state, and on the Ontario side, the ore on this range is almost invariably magnetic as far as known; but possibly there are sections of it over which the gabbro did not extend. South of Gunflint lake, on the Minnesota side, mining operations have been carried on during the past year, and it is expected that ore will commence to be shipped this year to Fort William over the line of the Port Arthur, Duluth and Western Railway.

Ore on Gunflint and North lakes.

The superintendent of the Barnum mine at Ishpeming, Mich., Mr. William Sedgwick, gave to the Mining Commission some information respecting ore deposits on this range on Gunflint and North lakes. On the north side of the first-named lake he stated that there is a rich magnetic ore suitable for Bessemer steel, the analysis of which gave 68 per cent. of iron, .028 per cent of phosphorus, no sulphur, and very little silica. He satisfied himself that there was at least 25 feet in thickness of this ore, but how much more he did not wait to determine, lest some one might take advantage of his discovery and purchase the property from the Government before him. He also obtained specimens from drift boulder and ledges of good quality ore at several other places on the north side of both lakes.[45]

Grady.

Michael Grady of Kingston, an explorer, has given the following information to the Bureau respecting the iron ores in this region, on the Ontario side of the boundary:

Exploring on the Mattawan river.

"I am in the employ of the Kingston and Pembroke Mining Company as prospector. I have been prospecting on the Mattawan river a tributary of the Kaministiquia, and also on Gunflint lake near the Minnesota boundary. I was there in company with Mr. Williams, P. L. S., of Kingston. We took up and explored seven locations on the Mattawan. These locations are situated about twelve miles southwesterly from Finmark station on the C.P.R. The ore we found there was a hard hematite. We explored the location called W 222, with the diamond drill which we had taken there the previous winter. We put down four holes to a depth of about 300 feet and found ore most of the way down. We had several assays made of it which averaged 50 per cent. metallic iron, and contained no objectionable impurities such as sulphur, phosphorus or titanium.

"The hill in which the ore occurs rises to a height of 100 or 150 feet above the level of the surrounding country. The ore crops out in the direction of the strike of the rocks, which is about north 70° east. The dip is nearly vertical. The next best location is W223, adjoining the above-mentioned on the west. The ore appears to be more solid here and has a somewhat slaty structure. The hill in which it occurs is about the same elevation as that on W222. The strike and dip are also the same on both locations. The country rock on the south side of the ore outcrops is greenstone, and on the north side a chloritic schist which sometimes partakes of the nature of a conglomerate. We did not use the diamond drill on W223, but put down three pits to a depth of eight or ten feet. Samples of the ore obtained

[45] Report of the Commission, p. 126.

assayed over 60 per cent metallic iron, with no objectionable impurities; good Bessemer ore. We did not find any outcrops of ore west of this location. Grady.

"As regards to the extent of these ore outcrops, I should say that on location W222 the deposit is about one-fourth of a mile in length and about 200 feet in the widest part, narrowing to about 50 or 60 feet at its eastern and western extremities. On location W223 the outcrop is nearly half a mile in length. In one place it is 400 feet wide. It narrows and becomes split up towards the southwest end. Extent of the ore bodies.

"At Gunflint lake the ore deposits are not so well defined. They are in nearly horizontal beds. We found some very good ore there. Assays gave about 60 per cent. iron with no objectionable impurities. We did no work there, except sinking a few test pits through the soil down to the ore-bed. The ore is different from the Mattawan, being magnetic. I should say that the Gunflint and Mattawan ranges are about 40 miles apart, the latter being northwest of the former. Horizontal beds of ore at Gunflint lake.

"We have not done anything along the Kingston & Pembroke road this year. The mines are all idle. I have not done any prospecting there either. At the present prices of iron ore we can't work these mines and ship the ore to the States in the face of the McKinley tariff. If the duty was off we could work them at a fair profit. There are no iron mines down here being worked this year that I know of."

David Williams of Kingston, a Provincial Land Surveyor, has been engaged in exploring for minerals and surveying mining locations in the same region for three years, and the following statement has been furnished to the Bureau by him: Williams.

"I am a Provincial Land Surveyor and reside in Kingston. I have been engaged during the last three years in mining surveys and explorations in the regions west of Port Arthur in the Thunder Bay district. I have made surveys and explorations at Gunflint lake along the international boundary, and had some test pits sunk on locations R311 and R317, where we found some very promising beds of ore. Assays gave about 60 per cent. metallic iron, with no sulphur, phosphorus or titanium. The ore lies in nearly horizontal beds, in what is sometimes called blanket ore. One deposit extends from location R205 westerly across R315 and partly across R317, It is from 50 to 150 feet wide. We did not do any blasting, so that I cannot say much about the depth or thickness of the bed, but its superficial area is so great that it will in any case yield a large amount of ore. Locations near the international boundary, at Gunflint lake.

"Another deposit lies along the northern border of location R311. It crops out of the side of a high hill, where it occurs in layers of varying thickness, alternating with thin layers of shale and rusty quartzites. There is every indication of a large body of ore. It can be traced along the side of the hill for nearly half a mile. I have since traced this ore formation northeasterly to near the southern boundary of the township of Strange, and have discovered a number of localities which give strong indications of the presence of valuable ore beds. There is no doubt but that this range is a northeastern extension of the celebrated Mesabi range in northeastern Minnesota.

"In the fall of 1890 I examined what is now called the Mattawan iron range. Mr. James Hammond of Fort William had prospected the range during the previous summer and had made some important discoveries. I reported very favorably and Mr. Hammond was joined by Messers. Folger Bros. of Kingston, and together they took up 17 locations along the range. Since then we have done some development work in different places on the property. The work on W222 and W223 has been described in Mr. Grady's evidence. During the last year Mr. Hammond has sunk a shaft to the depth of about 60 feet on location W211. This locality presents some very interesting features. One formation is about 200 feet wide. The surface rock Locations on the Mattawan iron range.

Williams.

consists largely of banded jasper and iron all broken up into small angular blocks, which a short distance below the surface are cemented together with iron, forming a breccia with the iron filling the spaces between the angular blocks and forming part of the blocks themselves. The jasper in the ore steadily diminishes with the depth, and we have good reason to believe that it will work out altogether a little deeper down. The ore is a fine-grained specular, very pure in spots. Large pieces could be obtained that would carry 65 to 68 per cent. of iron.

Exploratory work at Middle Falls, on the Mattawan.

"Two or three excavations were also made on location W 219, near what is called the Middle Falls on the Mattawan river. The ore formation is here about 200 feet high. The workable ore bed is about 60 feet wide and can be traced a long distance on the line of strike. It is thrown up into a hill about 200 feet wide. The excavations were in the form of cross-cuts into the hill, and they exposed a large fine body of ore. I think the assays gave about 54 per cent. good Bessemer ore. The Mattawan range can be traced eastward beyond the Kaministiquia station of the C. P. R.; but in this direction the ore becomes very lean, and large belts of jasper seem in some places to occupy the ore horizon. The ore belt seems to follow the axis of a synclinal, and I think that the folding of the ore bed upon itself will account for its great width in some places. On location W 223 it is 400 feet wide. It is by far the largest body of ore I have ever seen, and I believe it is one of the largest on record."

Conmee.

James Conmee, M.P.P., has furnished the Bureau the following information on the iron ore occurrences in the same localities:

Object of the Port Arthur, Duluth and Western Railway.

"I have been engaged in building the Port Arthur, Duluth and Western Railway. The line in Ontario is now completed, the distance being 87 miles to the international boundary at the southwest end of Gunflint lake. Our object was to reach the iron ore on the American side as well as the Canadian. For this purpose we have constructed six miles of road on the American side. We have a contract with the Gunflint Iron Company by which they undertake to ship 1,000,000 tons of iron ore at the rate of 100,000 tons a year. I have seen the deposit of iron ore at Gunflint lake, and it appears to be an extensive one. The outcrop, which occurs along the base of a high ridge of rock, varies in width from 10 feet at some points to 100 feet at others. I stepped along the outcrop, which was stripped in places, and found the length to be about 3,000 feet. I think there is a large body of ore there, and there is more further on; a mile beyond this place a diamond drill was set at work and it struck ore running in the same direction. I understand that pretty extensive tests have been made with the diamond drill, and a large body of magnetic ore is said to have been found I am told the ore assays from 63 to 67½ per cent. of metallic iron. It is almost entirely free from phosphorus, and contains very little titanium; it is claimed to be a first-class Bessemer ore. The ore will be sent over our line in bond, and then shipped on to Cleveland or some other place. I have reason to believe that the same range of ore crosses the boundary line into Ontario. It comes across right along our line of railway, at the Narrows between Magnetic and Gunflint lakes; I have seen several outcrops there myself. The greater part of the land on which these deposits occur is owned by Caldwell & Co. of Lanark, and Folger Bros. of Kingston. They had Mr. Williams there, and Mr. Michael Grady, both mining experts, who reported on the property and claimed to have found a very large body of ore. They stripped the ore in places, sunk several test pits, and had a number of men working there during the whole of the summer of 1891. They have not mined the ore at all: but they say that it is the same ore in appearance and quality as the American ore. The range has been traced into Ontario in a northeasterly direction as far as the vicinity of Whitefish lake, a distance of 35 miles far-

Ore bodies in the vicinity of Gunflint lake.

Tracing the range into Ontario.

ther ; there are outcrops of ore all along, in several places. It has not been traced beyond Whitefish lake. The Gunflint range, both on the Ontario and American sides, is a continuation of the Mesabi range in Minnesota. This at least is the general opinion of geologists. Mr. Winchell, assistant state geologist of Minnesota, was over there a few weeks ago, and he told me it was a continuation of the Mesabi range. The only difference is that so far as it has been developed the ore at this end is a hard ore, while at the other it is a soft ore in places. Conmee.

"There is another range of iron ore about four miles north of the one I have been speaking about, on the Ontario side, just lately discovered. I do not know much about its extent, but the ore is of very fine quality ; it assayed 65½ per cent. of iron and carried also a good percentage of manganese. This range is near Sand lake, four miles from our railway. The deposit has been found to be a large one. A pit has been sunk about 15 feet, and as far as the pit has shown up the vein it seems to be very much decomposed. They had not got down to what they considered the solid ore. The manganese appears to be dispersed among the ore, but it also occurs in pockets ; they have taken out small quantities of manganese almost pure. A parallel range near Sand lake, showing rich ore.

"I also know of the occurrence of iron ore on the Mattawan river ; I have been there. The principal owners are the Folger Brothers of Kingston. I own a location there myself, and Mr. Pumpelly and his friends own a very large block of land there. They have surveyed and explored it, but I do not think they are interested with Folger Bros. The latter have tested their locations with a diamond drill ; I am not aware that others have done so. I believe the ore there to be very extensive ; the vein is three hundred feet wide in places, and at no place that I saw was it less than 75 feet wide. The ore crops out at the surface in very many places, and is quite easily traced for 20 miles, running in a southwesterly and northeasterly direction. It is mostly hematite ; all that I saw was hematite. It is apparently not quite so rich an ore as the Gunflint or Atik-okan ores on the surface, from which assays show 45 to 55 per cent. of iron ; but where the prospectors bored with a diamond drill they have got very much better results ; they have got as high as 62 per cent. according to my information. The Mattawan range.

"There are outcroppings of iron ore farther north, but not of the same permanent character. The range crosses the Kaministiquia river about 20 miles west of Port Arthur, above the falls. This is not the range which extends into the townships of Ware and Gorham. The latter is a hematite ore, what I would call an iron slate. It occurs in a sort of slaty formation, and I should take it to go about 30 or 35 per cent of iron." Other ore ranges farther north.

The following paragraph on shows of iron ore on the Kaministiquia river is taken from Dr. Bell's report to the Director of the Geological Survey : Ore shows on the Kaministiquia river banded with jasper.

"In the hills on the left side of the Kaministiquia river a finely-banded rock made up of jasper and magnetic iron occurs at the distance of one mile southeast of the junction of the Mattawan. The alternating beds are usually not more than from one-half inch to two inches thick, and present a very striking contrast ; the jasper being brown or bright red, while the magnetic iron is black, finely granular and glistening. The beds are somewhat contorted, but their general strike appears to be about east and west. On the west side of the Kaministiquia river, at about a mile and a half below the Mattawan, the same ribboned jasper and iron ore rock occurs, associated with black arenaceous layers, semi-translucent banded chert, approaching chalcedony, and dark fine-grained hard ribboned argillite or felsite, having a conchoidal fracture. These strata are considerably contorted and dip at high angles, but their general course appears to be northwestward."[46]

[46] Geological Survey of Canada, 1866-9, p. 330.

Red hematite on Arrow lake, and slaty iron on Nipigon lake.

Dr. Bell also mentions the occurrence of iron ore at many other points west and north of lake Superior, specimens of which were shown to him, among them being pure red hematite from Arrow lake and a slaty iron ore from the east side of lake Nipigon. The latter was found to contain 51.51 per cent. of peroxide of iron (= 36.06 metallic iron), traces of manganese, .076 per cent. phosphoric acid and 8 of alumina.

THE ATIK-OKAN IRON RANGE.

A belt 15 miles in length.

Going farther west another extensive range of magnetic ore is found on Sabawe lake and Atik okan river, which has been traced a distance of 15 miles westerly on the course of the river to its junction with the Seine. Large deposits have also been discovered down in the valley of the Seine, but some analyses show these ores to contain titanium. Referring to the deposit on the Atik-okan or Antler river in the Mining Commission's report, Dr. Bell describes it as a large body of magnetite of fine quality. There are three beds in the widest part, each about fifty feet in width, separated from each other by narrow bands of rock running with the general course of the belt to which they belong. "The deposit," Dr. Bell wrote, "shows workable quantities of ore at intervals for about three miles, and is traceable for about five miles." But more recent explorations show that outcroppings occur over a distance of fifteen miles. Dr. Bell also refers to another rich deposit near the mouth of the Seine river, and one of lower grade ore at a straggling lake southeast of Wabigoon lake.[47]

Conmee.

Mr. Conmee, M.P.P., who has been over the Atik okan range, has supplied the following information respecting the shows of iron ore upon it:

"I have been on the Atik-okan range and have examined the iron ore there. This is the greatest deposit of iron ore I ever saw. There is a vein varying from 40 to 150 feet in width, and rising up to a height of 100 to 150 feet in places, and extending, so far as my observation goes, for about 25 miles. I have followed it for that distance myself, and it appears to be a continuous outcrop all the way, of pretty uniform width, but varying in height, dipping in places and rising again. It has been tested with a diamond drill on several locations by Thomas Marks & Co.: they have tested on locations of their own, and on those belonging to some Americans. The ore is magnetic On the surface it is a little decomposed, but it is all ore: there is very little mixture with it. It is said to carry a considerable percentage of sulphur, which is its only drawback, so far as I know. It runs up to 65 and 67 per cent. of metallic iron, and is of this uniform richness. It is a very rich ore.

Tracing the length of the range.

"This range is about 80 miles from any present railway; the northeast end of the range would be about 50 miles from the Canadian Pacific, at Fire steel river, or a little west of that point. The property could not be worked until a line of railway was constructed. The line of the Ontario and Rainy River Railway runs right across the southwest end of the range. This line has been located

Want of railway communication.

"There are no facilities for getting out the ore from the Mattawan range. There are portions of the vein which occur within about 8 miles of the C.P.R., near the Kaministiquia river. The deposit gets much richer farther west, and couldbe tapped either from the Port Arthur, Duluth and Western or the C.P.R. by a line of railway some 30 miles in length. The other deposits of ore are within convenient distance of the former railway."

McKellar.

The following description of the Atik-okan iron range was written by Peter McKellar and published by the Bureau of Industries, 1886, p. 409:

"This great magnetic iron deposit, on locations 10 E, 11 E and 12 E on

[47] Report of the Commission, p. 22.

the Atik-okan river, lies about thirty miles southwest of Bridge River station, Canadian Pacific Railway, which station is about ninety miles west of Fort William. The ore lode, which is divided into two or three branches in places, as at Iron mountain, has been traced by the outcrops for a distance of nearly four miles along the strike of the formation, with which it appears to conform in dip and strike. The formation consists of the Huronian green chloritic and dioritic schists, with a dip nearly vertical, or about 80° to 85° to the horizon northward. Herein I will describe Iron mountain only, the middle portion of the above run of ore, which is largely exposed and of which the examination was well and carefully made. The ore lode aggregates a thickness of 100 to 125 feet, divided into two and in places three veins by a belt or belts of the green schist 20 to 60 feet in thickness. This with the associated rocks forms a mountain range nearly a mile in length and 300 to 400 feet in width, and that rises to elevations of 60 to 125 feet above the surrounding plain; it therefore presents unusually favorable natural advantages for turning out a large quantity of ore in a short time. The ore is remarkably uniform in grade or percentage, and is described as follows by Professor Chapman of University College, Toronto, the leading authority on iron ores in Canada.

McKellar.

Locations 10 E 11 E and 12 E described.

Extent of the ore lode on Iron mountain.

"'The sample consists of fine-grained, comparatively soft black magnetic ore. As shown by analysis the ore is exceedingly rich in metal, holding 70 per cent. metallic iron, with very little silicious rock matter, very small amounts of sulphur and phosphorus, and no trace of titanium. Its specific gravity equals 4.93; hence the weight per cubic foot is equivalent to 307¼ pounds. So far as regards composition and physicial characters, a better ore could not be obtained.'

Analysis.

Ferrous oxide	29.98=metallic iron	23.32	—70.06.
Ferric oxide	56.77 "	46.74	
Titanic acid	None.		
Sulphur	0.06..(strictly 0.062).		
Phosphorus	0.02..(strictly 0.025).		
Alumina	0.67		
Silica	2.43		
	99.93		

"After the above sample test the deposit was systematically tested by American iron experts, who pronounced it first-class in every respect. The lode was closely sampled at several points and different samplings analysed, none of which showed titanium or sulphur. The percentage of metal was high, being 63 to 70, and the phosphorus low, or 0.011 to 0.035.

"The regularity of the stratification of the ore and schists along the surface shows that the ore deposit is not superficial or liable to give out quickly downward any more than it does along the surface horizontally. The lode may change in size a little either way in sinking 400 to 500 feet; but here it will be more likely to be in the direction of an increase rather than that of a decrease on account of the dip of the outside walls along the middle portion of Iron mountain.

"After a thorough surface examination of the Iron mountain lode, I estimate the quantity of good ore to exceed 2,000,000 tons for the 100 feet of depth, or 10,000,000 for 500 feet. I doubt if there is any other known iron deposit in either Canada or the American great iron districts of lake Superior that gives a more valuable show in regard to quality, quantity and the natural advantages presented for mining.

Estimate of ore in Iron mountain.

"The difficulty in the way of its present development is the distance to a railway or to navigable water. To make the ore available would necessitate the building of a railway branch thirty miles in length to connect with the Canadian Pacific, and negotiations are in progress that promise to result in the commencement of the work at no distant date. So much wealth as is known to exist here and the great trade its opening would create in the district are sure to cause the building of this branch before long.

McKellar.

"Besides the iron trade, the building of the proposed branch would open up other valuable industries in the locality. The rock formation consists largely of metamorphic schists associated with granite, a formation highly favorable for the bearing of metals. Even now, although the locality is but slightly known to the mineral explorer, two very promising gold veins (Partridge Lake and Osinawe lake veins) have been discovered within a radius of six miles of Iron mountain. There are some good tracts of timber lands in the locality; also farming lands, such as that in the grand valley of Seine river along which the proposed railway branch would run for the greater portion of its length. The Huronian and Animikie formations, the iron bearing rocks of the American iron districts on lake Superior, are largely developed in Canadian territory north of lake Superior and the American boundary."

Wiley.

The following statement has been furnished by Harold A. Wiley of Port Arthur, whose firm is interested in the Atik-okan range.

Locations west of lake Sabawe.

"I reside at Port Arthur and am a member of the firm of Thomas Mark & Co., merchants, forwarders and shipowners. For the last five years I have been dealing to some extent in mining lands, and I have also prospected in various parts of the district. Five years ago I became aware of the existence of iron ore on the Atik-okan river west of lake Sabawe, through the report of Indians. Two years previous to this Messrs. McKellar and Graham had discovered and taken up locations east of the lake which were reported to contain very large deposits of magnetic ore. In the summer of 1887 we sent out a party of explorers who continued in the field for several months and reported to us a discovery of ore west of the lake which showed outcroppings five miles in length. This is a continuation of the McKellar range, and the ore is of the same character. It is a series of low hills sixty to eighty feet in height, with intervals of low ground, the ore occurring in lens-shaped masses varying in width from ten to forty feet. The lenses are of various lengths, from one to ten chains. We carried on explorations with a diamond drill for six months during the season of 1891, having taken the drill in from Savanne station on the C.P.R. during the previous winter. Sixteen holes in all were bored, eight on our own properties (R100, 401 and 402) and eight on another location adjoining ours on the west (X212). On R400 the total extent of drilling was 340 feet; on R401, 792 feet; and on X212, 1,010 feet. In one of the vertical borings ore was found to a depth of 265 feet (this being the length of the drill rods) which averaged 64 per cent. of iron and showed only a trace of phosphorus. Some of the cores analyzed 68 per cent. iron. I am fully satisfied with the quantity and quality of the ore on the Atik-okan range. An eminent American geologist who examined it carefully assured me that upon two locations alone the quantity in sight was not less than 1,500,000 tons, and the range is at least thirteen miles in length."

Diamond drill explorations.

Two years ago last October W. W. Russell, P.L.S., of Port Arthur furnished at my request the information contained in the following paper on the Atik-ok n range:

Russell.

"During the past summer the extensive and rich deposits of magnetite on the Atik okan river, about one hundred miles west of Port Arthur, have attracted much notice from iron mining men, especially Americans, and have been visited by many prominent parties. The extent and high grade of the outcroppings have excited surprise invariably, though some expressed disapointment at finding no development work done.

First discovery of iron ore on the Atik-okan river.

"Some five years ago the first discovery of magnetite in this range was made, and a tract taken up by Messrs. Graham & McKellar. The property was shortly afterwards examined by Mr. D. H. Bacon (now superintendent of the Minnesota Iron Co.), and on his report bonded for a long term to a Cleveland party represented by Major Pickands. No active operations have

been begun. The discovery of the iron did not attract general notice in any way until the finding last fall of another equally extensive and rich deposit, several miles further west on the same range. The result of this was the starting of numerous exploring parties this summer, and the discovery of still other outcrops of the same ore further westward, until now these rich deposits have been traced by outcrops for a length of sixteen miles along the belt. Russell.

"Nothing more than a superficial examination of the deposits has been made in the way of a few surface cross-cuts, and an occasional shot to secure unweathered samples; but in many places the ore outcrops boldly, showing a varying width of from 10 to 50 feet.

"Before describing these outcrops or surface showings more minutely, I may refer to the geological occurrence of the deposits. They occur as beds in Huronian hornblendic and chloritic schists, which are nearly vertical, having a dip of 86 degrees north, and a strike of north 75 degrees east. The surface showings indicate that there are several of these beds, the intervening rock having a width of from five to thirty feet. Whether these beds will unite at a depth or maintain their separate identity, is a problem for development work to decide. The Huronian belt has an average width of eight miles, and rests conformably in the folds of the Laurentian rocks, so we may presume its depth (and that of the interbedded magnetite) to be very considerable, practically unlimited. Geological occurrence of the deposits.

"The McKellar-Graham property is the most easterly on the range, and its most conspicuous outcrops occur on the summit and both faces of a bluffy ridge running nearly east and west 100 feet above the level of the Atik-okan river. Mr D. H. Bacon sampled the surface showing here, taking samples at three-inch intervals; and for an aggregate width of 80 feet these samples gave 63½ per cent. metallic iron, without more than a trace of titanic acid or phosphorus, and little more than a trace of sulphur. The outcrops here showed three beds of ore. The McKellar Graham location, east of Sabawe lake.

"Immediately west of the McKellar-Graham property is Sabawe lake, a sheet of water three miles in length For some distance west of the lake, in the course of the iron belt, a considerable depth of soil covers everything; this extends to location R400, on which and R401 other outcrops occur very similar to those on the McKellar-Graham property. A similar ridge traverses these locations, and in many places, especially on the southern exposure, which is very steep, large outcrops occur. Having closely examined these and several locations adjoining them on the west, I can speak more definitely of them than of others where my inspection was more cursory; and it may be as well to state here that the ore throughout this range varies but slightly in character or grade; it is virtually identical throughout, though in some places where greatly exposed to atmospheric action it is, of course, leaner. On location R400, where a natural exposure of ore some twenty feet in width occurs, a large number of samples taken at random gave from 66 to 68½ per cent. metallic iron. On the location west of this, R401, a surface cross-cut was made this summer which showed 46 feet in width of ore; the full width was not ascertained, as the cut was abandoned on account of the depth of overlying soil and large boulders. Some of the ore from this cut, when protected by deep soil, gave as high as 71 per cent metallic iron. The range west of Sabawe lake.

"A little more than half a mile west of this the ore again outcrops on the south face of a ridge about fifty feet in height, the intervening ground being low; samples from here gave 65 per cent. Half a mile further west a short trench dug in the low ground showed rich ore at a depth of only three feet, no attempt was made to uncover the width of the deposit, the sole object being to locate it. A mile beyond this numerous showings are found along the top and south face of a ridge about 100 feet high; the surface showings here are very extensive, and the ore of the same high grade, 66 to 68 per Tracing the range westward

Russell.

cent. For nearly three miles beyond this the ground in the line of the deposits is very low, and no attempt to locate the ore by test pits etc., has been made. As the ground rises, the ore again outcrops and shows at the crossing of the Atik-okan river, which is very rapid at this point. Beyond this I have made no personal examination, but have been informed by several who have been over the ground that about a mile and a half west there is another extensive outcrop on a high ridge similar to those already referred to. The country is very low and swampy for some miles, and no further discoveries have been made—or perhaps I should say made public.

"Although no development whatever has been done, the surface showings alone indicate the presence of an enormous amount of iron, which is uniformly free from injurious elements, and of an astonishingly high grade, and I am of opinion that much of the leaner silicious ore which is now ignored in sampling will at a depth become a good marketable ore. Many of the natural outcrops are on the south slopes of the ridges, and are much weathered and oxidised, resulting, of course, in the impoverishment of the ore.

Railway communication.

"To bring the Atik-okan ores to a market, a railway from 30 to 50 miles in length will have to be built from near Carlstadt station on the Canadian Pacific Railway to and along the Atik-okan river. An examination of the route was made by the Canadian Pacific Railway company last fall, and their engineer reported it a very easy one, estimating the cost of grading at not over $2,000 per mile for four-fifths of the distance, the balance being medium work only, to cost say $10,000 per mile. The company are not disposed to build the road unless a reasonable amount of freight is guaranteed, but are willing to equip and operate the road when built if desired, and to facilitate the successful operation of the mines by cheap freight rates, etc. There is no local traffic for the railway throughout this section, and it is plainly to the interest of the company to promote to the utmost any undertaking that might lead to making this part of the line a remunerative one through local traffic. That they are fully alive to this is very evident in all intercourse on the subject with the chief officials of the company.

Market for the ores.

"With regard to the market for these ores, and the cost of delivering them thereat: Mining will cost from 75 cents to $1 per ton, say $1 as an outside estimate. Railroad freight to Port Arthur or Fort William, $1 per ton. Lake freight to either of the principal ore ports on lake Erie, Cleveland or Ashtabula, may be taken as the same as that from Ashland or Two Harbors, the shipping ports of the Gogebic and Vermilion districts. The rate last year and during the present season has been about $1.25 per gross ton, and there is no reason to think this will be exceeded in the future, considering the continual increase in numbers and tonnage of vessels built on the lakes. Shipping charges, insurance, etc., may be taken at 30 cents per ton; duty going into the United States, 75 cents per ton This will give the total cost, delivered at a lake Erie port, of $4 30 per ton. The present value of a high grade Bessemer ore, such as this under consideration, delivered on the docks at Cleveland or Ashtabula, is $6 per ton, which would leave a net profit of $1.70 per ton.

Shipments.

"The total lake shipments of iron ore amounted in 1888 to 4,700,000 tons, in 1889 to 7,300,000 tons, and up to and including 1st October of the current year, 6,480,000 tons. If the shipments for the balance of the season only equal those of the same part of last year, the total for 1890 will be about 8,500,000 tons.

"The Dominion Government gives a bonus of $2 for every ton of pig iron manufactured in Canada, and a portion of the Atik-okan ores might be profitably treated at Port Arthur or Fort William, where other ores for mixing, flux and fuel can be brought at low rates. Coal is carried here from lake Erie ports at from 40 to 50 cents per ton, and coke from 80 cents to $1.

There is no duty on anthracite coal, and coke also is admitted free for smelting purposes. Russell.

"I append hereto a number of analyses of the Atik-okan ore from different parts of the range, and also a plan showing the locality, etc.

	1	2	3	4
Silica	6.60	7.30	5.89	2.43
Alumina	1.09	1.80	.98	0.67
Ferrous oxide	none	none	none	23.32
Ferric oxide	87.66	86.90	88.36	46.74
Manganesic	trace	trace	trace	
Calcic	1.28	0.90	1.40	
Magnesia	0.75	0.60	0.75	
Phosphoric acid	.0079	0.069	0.025	
Titanic	none	none	none	none
Total	94.46	97.57	97.41	none
Metallic iron	63.47	62.84	63.97	70.06

Analyses of samples of ore taken from the McKellar-Graham locations.

The first three are averages from the three beds sampled by D. H. Bacon, of the Vermilion mines in Minnesota, and the last is a single specimen by Prof. Chapman of Toronto.

Samples taken by W. W. Russell from locations B400 and B401 :

	1	2	3
Metallic iron	68.50	65.90	65 702
Silica	2.90	5.80	4.20
Phosphorus	0.015	0.001	0.003
Sulphur	0.052	0.16	not specified
Titanic acid	none	none	none

Assays by Sharon Iron Works, Pa., of samples furnished by Capt. M. N. Garland from property marked "Garland locations :"

Metallic iron	68.75
Silica	1.41
Phosphorus	0.036
Sulphur	0.185

Assays of Atik-okan ore by Dr. Hoffman, assayer of the Geological Survey of Canada :

1. Magnetite from R402 :
   - Metallic iron 68.579
   - Titanium ..... none
2. Magnetite, R400 :
   - Metallic iron 68.027
   - Titanium ..... none
3. Magnetite from R403 :
   - Metallic iron 64.551
   - Titanium ..... none
4. Magnetite from line between mining locations 10E and 11E, collected by Smith :
   - Metallic iron 65.710
   - Titanium ..... none

Henry Lloyd Smith of Newport, Rhode Island, who with Raphael Pumpelly has taken up several locations in this part of the Province, has given to the Bureau the following description : Smith.

"I am a mining engineer, living in Newport, Rhode Island. I have been on the Geological Survey of the United States for five years, and have spent two seasons, or practically two years, exploring for iron ore in western Algoma, chiefly northwest of Port Arthur. My explorations have been Exploring for iron ore in Ontario, on the Atik-okan range.

Smith.

wholly for iron ore. I spent several weeks on the Atik-okan river, where iron ore occurs in irregular lenses in greenstone, both walls, so far as we know, being greenstone. The ore occurs in a single range; that is, the ore bodies are found within a distance across the formation of 300 feet or less. The range is found both north and south of the river, which flows parallel to it, and crosses it several times in the course of 12 or 15 miles. The exposures of ore in some instances rise above the level of the country, and are some 80 to 100 feet above the river in places. On the locations belonging to Mr. Wiley and Mr. Marks of Port Arthur, on the north bank of the river, the ore is some 70 or 80 feet above the water. The ore of course is not continuous for the entire length of the range. On this property I do not think there is a single lens of ore that can be traced for more than 200 to 250 feet. There are considerable intervals of barren rock, more or less ferruginous. The limit between the ore and the rock is not so much a geological as a commercial one; that is, the ore gradually merges into the greenstone. In the middle of the lens you have a pretty pure magnetite, then, as the edges of the lens are approached, there is a greater or less mixture of rock, then gradually more rock comes in and less ore, until finally it passes altogether into rock. The physical characteristics of the ore are those belonging to magnetite. We have had extensive analyses made of it, but I do not bear in mind the figures; so far as I remember, the highest result we got was about 68 per cent. of metallic iron, which was not from a picked sample at all, but taken at intervals from a body of the ore 18 feet in thickness, and represented the same very fairly. It was a beautiful clean ore. The general character of the ore throughout the range is that of a fairly clean ore. I am interested in the property there along with other gentlemen. We have a location about a mile in length, containing about 160 acres. So far as we can see there is a large body of ore there, but it is impossible to speak definitely as to its extent.

On Steep Rock lake.

"Besides the Atik-okan river I have been on the Steep Rock lake, which is several miles west of the Marks and Wiley locations. The iron formation there overlies limestone. There is no body of clean ore exposed, but I do not think there is any question about iron ore being there. There are fragments of iron ore in the glacial drift along certain parts of the shore of the lake. The bodies of the ore there are probably under the waters of the lake, which are very deep, and I doubt if they have any commercial value.

On the Mattawan river.

"I have also explored along the Mattawan river, where we find very hard red hematite ore banded with jasper. It has not yet been found in any commercial bodies; iron formation alone has been found there, consisting of jasper banded with hard hematite, in which one would naturally look for bodies of ore. The formation is one very similar to the one in northeastern Minnesota. There is a large amount of this ferruginous material, but as yet no ore bodies have been found. We did no exploration with the diamond drill there. I understand that some gentlemen from Kingston have done some exploration with the drill there, but I do not know anything about the results they got. I have not been over this iron-bearing formation along the Mattawan for more than four or five miles. I have found it to be practically continuous for this distance, and I have no doubt that it extends considerably further. It is very hard to say whether the range is a wide one or not. It is probable that the iron formation is folded into several parallel troughs.

On Gunflint lake.

"I have not explored along Gunflint lake; I have simply taken a trip to that district. I did not see any ore bodies there. There is a very good-looking jasper in that section, and I think a great deal more of it since the discovery of the Mesabi range than I did when I went over it. It belongs in nearly the same geological horizon as the Mesabi ores, being near the base of the Animikie series.

"I have been on the Mesabi range; the iron ore occurs not far above the base of the Animikie. The section shows that there is a time-break between the Animikie and the rocks beneath, which in some places are granite and in others green schists, that may be lower Huronian. Upon these the Animikie beds lie nearly flat, with a slight dip to the south. The lowest part of the Animikie is a quartzite, the thickness of which I do not know. The upper part of this quartzite becomes ferruginous and passes into ferruginous chert, which is the member containing the ore. Here and there are local concentrations of clean ore, some of which are of enormous dimensions. The great point in favor of the explorer on the Mesabi range is that the ore bodies lie flat, or at a less inclination than in any other portion of the iron districts of lake Superior. In the other iron districts these lenses are more nearly vertical, and you get simply the thickness exposed on the surface. On the Mesabi range they lie on their broad face, and you have the largest dimensions of the lens parallel to the surface. The chances of hitting any ore body that may exist on any property in exploration are thus enormously increased. In some parts of the Mesabi range the ore is not solid, but granular, of the consistence of sand; in other parts it is quite hard.

Smith.

The Mesabi range.

Its extension into Ontario.

"I understand that the range is being worked near Gunflint lake, on the American side, but I have not seen it. There is no doubt whatever that rocks similar to those constituting the Mesabi range extend northeastward into Ontario; they come as far eastward as Loon lake, where they seem to be cut off by the Keweenawan series.

"I have not seen any large bodies of ore in the townships of Ware and Gorham. There are possibilities that ore may be found in these townships in quantities, but I do not regard the chances as very good.

Ores north of the Height of Land.

In the report of the Geological Survey for 1875-6, Dr. Bell gives an account of a large deposit of iron ore in the Devonian formation on the Mattagami river, in the vicinity of the Grand Rapids, latitude 50.30 north and longitude 82° west. "Its position is on the northwest side of the river, at the foot of the rapids. It runs along the foot of the cliff for a distance of upwards of three hundred yards, almost continuously, with an exposed breadth of twenty to twenty-five yards. The highest points rise about fifteen feet above the level of the river. The surface is mottled. reddish-yellow and brown, and has a rough, spongy or lumpy appearance, like that of a great mass of bog ore. At the surface, and sometimes to a depth of several inches, it is a compact brown hematite, occasionally in botryoidal crusts, with a radiating columnar structure; but deeper down it is a dark-gray compact, very finely crystalline spathic ore, apparently of a pure quality. The brown hematite evidently results from the conversion of the carbonate. The former yields, according to the analysis of Mr. Hoffman, 52.42 per cent. of metallic iron, while the latter shows a very small amount of insoluble matter; indeed there is, chemically, little room for impurities, since it gives rise to so rich a brown hematite. The geological relations of this singular deposit are puzzling; it may be of newer date than the limestone gorge in which it occurs. The adjacent overlooking wall of soft earthy limestone is worn into vertical caverns, with fluted and rounded walls, like the sides of great pot-holes. They are sometimes partially lined with a thin coating of a highly ferruginous carbonate. The iron ore was nowhere seen quite in contact with the rock."[48]

Spathic ore on the Mattagami river.

Mr. E. B Borron has been employed for several years by the Ontario Government exploring the Hudson Bay slope, and it is his opinion that iron ores are to be found there in inexhaustible quantity. In his evidence before the Mining Commission he stated that, as far as yet discovered, these

Borron's explorations on the Hudson Bay slope.

[48]Geological Survey of Canada, 1875-6, p. 321.

Varieties of iron ores reported by him.

ores are chiefly carbonate of iron associated with limestone; rich brown hematite ore, resulting, as would appear, from the decomposition of the carbonate; bog-iron ores, magnetic ore and specular ore. The carbonate, brown hematite and bog ores, Mr. Borron says, doubtless exist in very large quantities. Magnetic ore has been found in places near the height of land, and probably in considerable quantity, but specular ore has been found only in loose or float pieces.[49]

Conclusion.

This sketch of the iron ores of the Province is of necessity fragmentary and incomplete. No individual man has been able to explore the whole field. The officers of the Geological Survey have been working upon it for half a century, yet there are thousands of square miles in the mineral-bearing regions of the Province which remain virgin ground for them. Prospectors have traversed many districts in a hurried way, but there are large areas which their wandering feet have not trodden. Nothing has been attempted here but to bring together, in condensed form convenient for reference, the information which scientific explorers and mining prospectors have gathered, and which has been recorded in reports, documents and papers of different kinds during the last half century. Doubtless many other bodies of ore will be discovered, especially when mining operations begin to be carried on; and some time in the not far off future the Bureau may be able to present a fuller, more accurate and better rounded report on those latent resources of our Province than is possible at present. But the information now given may be the means of aiding and stimulating further search, and may possibly also be the means of directing the attention of capitalists and iron masters to a realm of opportunity second to no other remaining open to enterprise upon the American continent.

Ontario's Iron Ores at the World's Fair.

Catalogue of the Ontario exhibit of iron ores at the World's Fair.

As an Appendix to this paper I give the Catalogue of Iron Ore exhibits made by the Province of Ontario at the World's Columbian Exposition, prepared by Mr. David Boyle, the officer in charge. It will be noticed that numerous localities are represented in this collection to which no reference has been made in the foregoing pages. The number of samples shown is 120.

1. Magnetite: Wilbur mine, lot 3, concession 13, township of Lavant, county of Lanark. Extent of deposit, 1,200 feet by 15 feet. Average lots analyze 60 per cent. iron, 6.31 per cent. silica, and .009 per cent. phosphorus, but the sample exhibited will yield about 68 per cent. iron. William and Thomas B. Caldwell, Lanark.
14. Magnetite: Lot 22, concession 9, township of Wollaston, county of Hastings. Length of deposit, one-quarter of mile; breadth, 25 feet. Thomas Nugent, Nugent P.O.
15. Magnetite: Lot 17, concession 8, township of Wollaston, county of Hastings. William Jenkins, Madoc.
16. Magnetite: Lot 15, concession 2, township of Wollaston, county of Hastings. Area of deposit, 500 feet by 180 feet. Clute & Brown, Belleville; Jenkins & Chambers, Madoc.
17. Magnetite: Lot 17, concession 8, township of Wollaston, county of Hastings. Area of deposit, 1,500 feet by 30 to 120 feet. Clute & Brown, Belleville; Jenkins & Chambers, Madoc.
18. Magnetite: Lot 18, concession 8, township of Wollaston, county of Hastings. Samples from a depth of 20 feet. Area of deposit, 1,500 feet by 40 to 60 feet. Clute & Brown, Belleville; Jenkins & Chambers, Madoc.

[49] Report of the Commission, p. 69.

19. Magnetite: Lot 15, concession 1, township of Wollaston, county of Hastings. Length of bed, 1,200 feet; breadth, from 25 feet to 100 feet. Jenkins & Chambers, Madoc.
20. Magnetite: Township of Wollaston, county of Hastings. Jenkins & Chambers, Madoc.
21. Magnetite: Lot 16, concession 2, township of Wollaston, county of Hastings. Area of deposit, 1,400 feet by 25 to 50 feet. Clute & Brown, Belleville; Jenkins & Chambers, Madoc.
22. Magnetite: Township of Wollaston, county of Hastings. Jenkins & Chambers, Madoc.

Catalogue of the Ontario exhibit of iron ores at the World's Fair.

92. Magnetite: Calabogie mine, lot 16, concession 8, township of Bagot, county of Renfrew. An analysis of one lot gave 66.34 per cent. iron, 1.04 silica, .140 phosphorus, titanium a trace, and no sulphur. Calabogie Mining Company (Limited), Perth. Ontario Government collection.
93. Magnetite: Between the Canadian Pacific Railway and Amethyst Harbor, township of McGregor, Thunder Bay district. From a bed showing seven feet and the lower rock not yet reached. It lies in the lower portion of the Animikie rocks. Ontario Government collection.
94. Magnetite: Locations 1 and 2, Herrick's survey, at mouth of Little Pic river on west side, Thunder Bay district. The Canadian Pacific Railway passes through the locations. Ontario Government collection.
95-100. Hematite: Lots 23 to 27, concessions 11 and 12, township of Darling, county of Lanark. James Bell, Arnprior.
101. Magnetite: Atik-Okan range, location 402 R, Thunder Bay district. It is free from injurious combinations, and runs from 63 to over 70 per cent. of iron. The deposit forms a mountain range with the associated Huronian green schists and diorites, rising to an elevation above the surrounding plain of 50 to 125 feet, and extending along the run of the ore for nearly a mile. There are two veins of ore, with 50 feet to 60 feet of slate between, and for a good portion of the distance the veins will aggregate a thickness of 100 feet. South Shore iron experts who have examined the location pronounce it one of the best iron deposits known. H. A. Wiley, Port Arthur.
103-105. Magnetite: Lot 16, concession 9, township of Bagot, county of Renfrew. Ontario Government collection.
106-108. Specular: Lot 29, concession 14, township of Clarendon, county of Frontenac. Large deposit, fully 1,000 tons in sight; partly developed. Allison & Platt, Adolphustown.
109. Magnetite: Lot 17, concession 10, township of Portland, county of Frontenac. William Pursey, Verona.
110. Magnetic iron sand: Shore of Lake Superior, between White and Cascade rivers. Vein eight inches deep, traced for one thousand feet. F. A. Fenton, Toronto.
160. Magnetite: Lot 27, concession 4, township of Snowdon, county of Haliburton. T. D. Ledyard, Toronto.
161. Magnetite: Lot 5, concession 6, township of Lutterworth, county of Haliburton. T. D. Ledyard, Toronto.
163. Magnetite: Lot 25, concession 4, township of Snowdon, county of Haliburton. T. D. Ledyard, Toronto.
165. Limonite: Township of Snowdon, county of Haliburton. T. D. Ledyard, Toronto.
166. Magnetite: Lots 13 and 14, concession 10, township of Bagot, county of Renfrew.
167. Magnetite: Township of Clarendon, county of Frontenac. Allison & Platt, Adolphustown.
168. Magnetite: Paxton mine, township of Lutterworth, county of Haliburton. T. D. Ledyard, Toronto.

Catalogue of the Ontario exhibit of iron ores at the World's Fair.

169. Magnetite: Mountain mine, township or Lake, county of Hastings. R. C. Clute, Belleville.

170. Hematite (specular): Echo lake, Algoma district. P. C. Campbell, Sault. Ste. Marie.

171. Magnetite: Lot 4, concession 9, township of Palmerston, county of Frontenac. Surface shows 200 by 50 feet. Analyzes 63 per cent. iron, 2.14 per cent. silica, and only traces of phosphorus and sulphur. Ontario Government collection.

172. Magnetite: Wilbur mine, lot 4, concession 12, and lot 4, concession 13, township of Lavant, county of Lanark. Area of deposit, 1,200 feet by 15 feet. Average lots analyze 60 per cent. iron, 6.31 per cent. silica and .009 phosphorus. W. C. Caldwell, Lanark. Ontario Government collection.

174 Magnetite: Iron Duke mine, township of Darling, county of Lanark, five miles from the Kingston and Pembroke Railway. Contains by analysis 65.33 per cent. metallic iron, .017 phosphorus, and no titanium. Extent of location, 3,000 acres. Wylie & Co., Carleton Place.

175. Hematite: Echo lake, East Algoma district. P. C. Campbell, Algoma Mills.

176. Hematite (specular): Echo lake, East Algoma district. P. C. Campbell, Algoma Mills.

177. Hematite (kidney): Silver lake, Thunder Bay district. It analyzes 68 to 69 per cent. of metallic iron, with no injurious ingredients in combination; seems to be in large quantities, but owing to irregularity will require development to show the actual extent; is the same kind of ore, and is in the same geological horizon as that of the famous Colley mine of the south. shore of lake Superior. It has been explored to a small extent by mining. P. McKellar, Fort William. Ontario Government collection.

178. Magnetite: Lot 25, concession 4, township of Snowdon, county of Haliburton.

179, 180, 184, 187, 191, 192. Magnetite: Belmont mine, township of Belmont, county of Peterborough.

181, 183, 185, 186. Magnetite: Lot 25, concession 4, township of Snowdon, county of Haliburton. Several outcrops of ore on lots 25, 26 and 27, extending at intervals over a space of nearly three quarters of a mile, situated on high ground overlooking the railway track, and ore may be raised and loaded on the cars for one dollar per ton. Analysis of ore from lot 25 gave metallic iron, 62 per cent; sulphur, .025; phosphorus, a trace, and no titanium. From lot 27 gave metallic iron, 62.57; phosphorus, .025; sulphur and titanium, none. The Irondale, Bancroft and Ottawa Railway runs through lots 25 and 26, and in front of 27, connecting with the Midland branch of the Grand Trunk, about eight miles west of the mines. T. D. Ledyard, Toronto.

188. Hematite: Township of Darling, county of Lanark. Wylie & Co., Carleton Place.

189. Hematite: Township of Madoc, county of Hastings. Mrs. J. A. Wallbridge, Belleville.

190. Hematite: Iron island, Thunder Bay district. Ontario Government collection.

284. Magnetite: Lot 19, concession 1, township of Belmont, county of Peterborough. "A railway is now being constructed to the Belmont mine. It has been estimated that this ore bed contains over 1,000,000 tons of ore within 100 feet of the surface, and the stripping is very light. The ore bed has been thoroughly explored, and of the numerous samples which I have analyzed the above example is a fair average. It will be noticed that this ore equals the best of the famous Swedish Dannemora ore in regard to its low phosphorus contents, contains much less sulphur, and from 10 to 20 per cent. more iron." Wm. Molin in The Engineering and Mining Journal, November 19th, 1892, p. 484. Bessemer Iron Mining Co.

301. Magnetite: Lots 9 and 10 (400 acres), concession 8, township of Bathurst, county of Lanark. Analysis shows metallic iron 65.07, insoluble silicious matter 6.66, soluble silica 44, sulphur .05, phosphoric acid .06, alumina .06, lime .16. John Hart, Perth.

302 Magnetite: Atik-Okan location (see 101), Thunder Bay district. W. W. Russell, Port Arthur.

Catalogue of the Ontario exhibit of iron ores at the World's Fair.

368. Specular: Township of Loughborough, county of Frontenac. W. G. Kidd collection.

370. Magnetite: Township of North Crosby, county of Leeds. W. G. Kidd collection.

371. Magnetite: Robertsville mine, township of Palmerston, county of Frontenac. W. G. Kidd collection.

372. Magnetite: Wilson location, township of Lavant, county of Lanark. W. G. Kidd collection.

373. Magnetite: Glendower mine, township of Bedford, county of Frontenac. W. G. Kidd collection.

438. Magnetite: Lot 31, concession 4, township of Snowdon, county of Haliburton. Analysis by Prof. Wm. Molin, New York, shows metallic iron 69.246, phosphorus .012, sulphur .038, titanic acid trace only. T. D. Ledyard, Toronto.

440. Magnetite: Lot 27, concession 4, township of Snowdon, county of Haliburton.

441, 442, 444. Magnetite: Belmont, county of Peterborough.

443, 446. Magnetite: Lot 25, concession 4, township of Snowdon, County of Haliburton. T. D. Ledyard, Toronto.

447. Magnetite: Lot 31, concession 4, township of Snowdon, county of Haliburton. T. D. Ledyard, Toronto.

477. Magnetite: Robertsville mine, township of Palmerston, county of Frontenac. W. G Kidd collection.

478. Magnetite: Glendower mine, Janesville, county of Addington. W. G. Kidd collection.

483. Magnetite in calcite: Robertsville, township of Palmerston, county of Frontenac. W. G. Kidd collection.

579, 581. Magnetite (black Bessemer): Easterly 90 acres of each of lots 3 and 4, concession 9, township of Palmerston, county of Frontenac. Property known as the Roberts mine, on Kingston & Pembroke Railway, about 60 miles from Kingston. Assay by J. H. Hulbert, Duluth, shows 67.3 of iron, with remarkable freedom from deleterious matter. When the mine was worked, consignments of ore were forwarded to Pittsburgh, Pa., and guaranteed 65 per cent. of iron, free from sulphur. The main shaft is upwards of 300 feet deep, and the ore appears to exist in immense quantities. F. W. Ferguson, Winnipeg, Man.

628. Hematite: Wallace mine, north shore of Lake Huron, Algoma district. Thomas Frood, Little Current P.O., Algoma.

749, 751. Hematite (gray): Lot 7, concession 10, township of Portland, county of Frontenac. Ontario Government collection.

750. Magnetite: Lot 7, concession 10, township of Portland, county of Frontenac. Ontario Government collection.

752. Bog ore: Lot 28, broken front concession, township of Gainsboro' county of Lincoln. Ontario Government collection.

763. Hematite (deep red and soft): Lot 7, concession 10, township of Portland, county of Frontenac; two miles from Kingston & Pembroke Railway. Drill shows a depth of 65 feet. This ore seems well adapted to the manufacture of pigments. Ontario Government collection.

787. Magnetite: Glendower mine, township of Bedford, county of Frontenac. Analysis gives 62 per cent. metallic iron. Good railway connection on Kingston & Pembroke Railway. Ontario Government collection.

Catalogue of the Ontario exhibit of iron ores at the World's Fair.

788. Magnetite and Hematite: Lot 17, concession 10, township of Portland, county of Frontenac. Ontario Government collection.

813. Magnetite: Lot 25, concession 5, township of Darling, county of Lanark. Assay shows from 66 to 68.85 metallic iron, earthy matter 28.554, silica 2.60, phosphorus .026. Robert McGregor, Calabogie.

814. Magnetite: Lot 38, concession 1, township of Clarendon, county of Frontenac. Property has not been worked. Vein from 6 to 10 feet wide; thirteen miles from Lavant station, Kingston & Pembroke Railway. Ontario Government collection.

855. Magnetite (large sample): Atik-Okan location, Thunder Bay district. (See No. 101.) A. L. Russell, Port Arthur.

859. Hematite: Nipigon, Thunder Bay district. Wiley collection.

872 Hematite: Lot 13, concession 9, township of Marmora, county of Hastings.

897. Magnetite: Township of Glamorgan, county of Haliburton. Haliburton Mining Co., Toronto.

908. Magnetite: Coe Hill, township of Wollaston, county of Hastings, on the line of the Central Ontario Railway. The deposit is about 2,000 feet long and over 100 broad, forming a high ridge from which a large quantity of ore has been mined. The analysis gives nearly 70 per cent. of metallic iron, with a small proportion of sulphur, but no titanium. J. D. Riddell, Supt. C. O. R., Trenton.

1064-1076. Magnetite and Hematite: Cabinet specimens from various localities in eastern Ontario. J. L. Aunger collection.

1176. Magnetite: This specimen is part of a boulder found by Mr. William Jenkins of Madoc, within a few miles of that town. It is so strongly magnetic as to constitute loadstone. James F. Boyle, Toronto.

1177. Magnetite: Lot 10, concession 6 (known as "The 49 acres"), township of Madoc, county of Hastings. Mrs. J. A. Wallbridge, Belleville.

1178. Hematite: Lot 12, concession 5, township of Madoc, county of Hastings Mrs. J. A. Wallbridge, Belleville.

1333. Hematite (kidney): S. G. Fogg, Rat Portage.

1423. Hematite: Lot 2, concession 6, township of Sheffield, county of Addington. This mine is three-fourths of a mile from Tamworth, on the Napanee & Kingston Railway. Leonard Wager, Tamworth.

1455, 1472. Magnetite: Gunflint lake, Thunder Bay district. "This is said to be one of the largest and best iron deposits in Ontario. Several analyses show not less than 64 per cent. metallic iron, with freedom from deleterious matters." W. C. Caldwell, Lanark.

1485, 1486. Magnetite: Emily mine, and St. Charles mine, township of Tudor, county of Hastings. Henry Johnson, Coe Hill.

1487. Magnetite: Cameron mine, township of Chandos, county of Peterboro'. Henry Johnson, Coe Hill.

1490. Hematite: Arthur mine, township of Chandos, county of Peterboro' Henry Johnson, Coe Hill.

1492. Hematite: Township of Wollaston, county of Hastings. Henry Johnson, Coe Hill.

1561. Limonite: Echo Bay. Nelson Simmons, Echo Bay.

IV.

TREATING IRON ORES AND METALLIC IRON.

It has been shown that we have iron ores in many localities, east, west and north. We have bog ores, red and brown hematite ores, magnetic ores and carbonate ores. But we have not one working mine in the Province, nor one blast furnace for the smelting of iron ores. The United States is making and using about 9,000,000 gross tons a year, being at the rate of one-seventh of a ton or 320 lb. per head of the country's population. What the consumption is in Canada cannot be so definitely ascertained. A small portion of the whole is produced in the country, the quantity of which is known. The great bulk is imported, chiefly from Great Britain and the United States; part of it as pig iron, but much the larger portion as manufactured goods, or as iron and steel in various stages of manufacture. The Trade Tables of the Dominion classify the imports by articles and values, and to a certain extent by weight also. In so far as the latter classification is given we have a basis upon which to estimate the total quantity of our iron and steel imports, and for the purpose of making such an estimate the following comparative table of quantities and values has been compiled from the trade reports of the Dominion for the fiscal years 1881-2 and 1891-2:

Enquiry into production and consumption.

IMPORTS OF IRON AND STEEL.

Articles.	1881-2		1891-2.	
	cwt.	$	cwt.	$
Band and hoop iron	73,860	129,931	92,014	143,853
Bars, rolled, etc	891,494	1,328,610	133,353	231,468
Plates and sheets	271,805	714,187	442,038	1,067,027
Carwheels and forgings	27,326	74,492	25,541	105,036
Chain cables	31,084	79,103	23,803	63,263
Slabs, blooms, etc	203,888	222,056	64,397	56,186
Bridge and structural iron	49,664	212,527	6,018	27,363
Nails and spikes	11,382	51,217	9,871	40,276
Scrap iron and steel	26,545	20,406	740,687	507,018
Pig iron	1,268,620	1,023,012	1,378,360	886,485
Railway iron (rails, fish plates, etc.)	117,667	184,459	126,329	189,199
Rolled beams, etc	41,921	83,852	153,510	220,287
Nail and spike rods	16,661	24,806	16,795	36,090
Wire	121,328	455,464	72,149	219,643
Locomotive tires	8,943	45,180	27,609	86,294
Iron and steel for ships	8 978	45,819	36,703	70,663
Steel ingots, bars, etc	328,382	895,857	159,994	421,530
Steel rails	2,279,959	3,531,330	1,654,935	1,738,661
Steel for manufacturers	1,002	5,974	45,683	180,901
Totals	5,780,509	9,127,382	5,209,780	6,291,243

Statistics of iron and steel imports.

The average value per net ton in the first of those years would therefore be $31.58, and in the second $24 15 In 1881-2 the total value of our imports of iron and steel was $17,075,588, and in 1891-2 it was $12,641,442.[1]

Averages of value.

[1] In 1881-2 the value of dutiable iron and steel was $12,301,974, upon which the duty levied was $2,593,994.04, or 21 per cent. The value of the free was $4,773,614. In 1891-2 the value of the dutiable was $9,968,409, upon which the duty levied was $2,792.068.12, or 28 per cent. The value of the free was $2,673,033. The decrease in values of the Canadian imports

Assuming the average values per ton to be the same as those deduced from the table, the total quantity imported in 1881-2 would be 540,709 net tons, and in 1891-2 it would be 523,455 tons. Of these quantities pig iron constituted only 63,431 tons in 1881-2, and only 68,918 tons in 1891-2, the balance in the respective years being manufactured or partly manufactured iron and steel. In order therefore to make a fair comparative estimate of consumption per head of population, allowance should be made for waste in the refining of pig iron when remelted for making cast or rolled iron and for conversion into steel. Sir Lowthian Bell estimates the waste in the conversion of pig iron into steel by the basic process at 25 to 30 per cent., and by the ordinary Bessemer process at 12 per cent.[2] But of course the rate of waste will vary with the qualities of iron treated, and also no doubt with the processes used. If we take an average waste of 10 per cent., which I think is very moderate, the iron and steel imported into Canada in the manufactured and partly manufactured state will represent an equivalent in pig iron for 1881-2 of 530,310 tons, and in 1891-2 of 505,040 tons. In the first of these years the quantity of pig iron made in Canada was about 25,000 tons, and in the second it was 30,294 tons. Add the quantity which was imported as pig iron in the respective years, and the total consumption of the country would be the equivalent of 618,741 net tons of pig iron in 1881-2 and 604,252 tons in 1891-2, or at the rate of 288 lb. per head of population in the former and 252 lb. in the latter year. If the waste by conversion was taken as 15 per cent. the average consumption per head in the first-named year would be 302 lb and the second 264 lb.[3] But this rate of consumption is not uniform over the whole of Canada. In the more prosperous sections it will be highest, unless there should be exceptional circumstances, like

Pig iron equivalent of consumption.

Consumption per capita.

of iron and steel is a consequence of the fall which has taken place in prices in the countries of production. An average of quotations of pig iron given in the London Iron for six months ending December 31 of 1881 and 1891 shows that the price of Scotch warrants (Glasgow) in the former period was 49s. 8¼d. and of Cleveland warrants (Middlesboro') 40s. 8d., and in the latter period 47s. 3d. and 40s 0½d. per ton respectively. Scotch pig therefore fell only 4 per cent. in the ten years and English pig only 1½ per cent. But the decline in steel was much greater, the average of quotations for steel bars (Bessemer or Siemens-Martin) at the works being for the former period £9 to £10 and for the latter £6 13s. 4d. to £7 1s. 8d. per ton, or a fall of 27⅞ per cent. This is a result due partly to increase in competition, but largely also to the more general adoption of improved processes in the manufacture of steel. Sir Henry Bessemer's process has indeed wrought a revolution in prices. When his patent was taken out in 1855 the price of steel in Great Britain was $250 per ton, and the annual production was only 50,000 tons. Thirty-two years ago, when his works were started at Sheffield, steel rails sold at $115 to $120 per ton, and in 1888 they had fallen to $20. The first Bessemer rails were made in the United States in 1867, and the selling price in Philadelphia was then $166 per ton; five years later, when production had risen in that country to 120,000 tons, the selling price was $112 per ton. In 1874 it fell in Philadelphia to $94, in 1878 to $42.25, and in 1885 to $28.50. This great lowering of price is a result accomplished by the invention of Sir Henry Bessemer, and the outcry against the late Alexander Mackenzie for purchasing steel rails in a falling market is worth recalling in connection with it. As showing the progress made in the manufacture of steel, it may be stated that while in 1877 the total production of Bessemer steel ingots in Great Britain and the United States was 1,250,524 gross tons, it had risen in 1890 to 5,733,714 tons. But the two countries had also in the latter year produced in addition 2,139,020 tons of open-hearth steel.

[2] Principles of the Manufacture of Iron and Steel, pp. 411-12. In Carroll D. Wright's Report on the Production of Iron, Steel, Coal, etc., (sixth Report of the U. S Commissioner of Labor) the waste in making finished bar iron, computed from records of twenty establishments, is found to be 18¼ per cent, the average loss in making a gross ton being 482 lb. The materials used were muck bar, scrap, pig iron, and in six cases a small quantity of iron ore: but the bulk of the material was muck bar (p. 126). The waste in making steel ingots, chiefly from pig iron, computed from the records of eight establishments in the United States, seven in Great Britain and five in Europe, is 318 lb., or 12½ per cent. (p. 154) And in making steel rails from ingots, blooms and billets, the records of two establishments in the United States, three in Europe and three in Great Britain show a loss by waste of 348 lb. in the production of a gross ton, or 13½ per cent. (p. 165) At every stage in the manufacture of iron and in every heating of it there is inevitable waste of material.

[3] The higher rate of consumption in 1881-2 is due in part to the supplies of steel rails, fish plates, spikes, etc., imported that year free for original construction of the Canadian Pacific Railway. But the whole of this quantity was only 34,797 tons, or 16 lb. per head of the population; and with this allowance made the excess of consumption in 1881-2 over 1891-2 is still 20 lb. per head (or 22 lb. if loss by waste is calculated at 15 per cent. It will be remembered however that 1881-2 was a year of boom.

railway construction, to create abnormal demand in the poorer or more sparsely settled districts. Our wants in Ontario can hardly be less than those of the average United States citizen; the probability is that they are higher, since there are few States of the American Union as wealthy as this Province, or in which the requirements of industrial and commercial life are as great. Instead therefore of a present requirement of 252 lb. per head of population, it may be assumed that our yearly consumption is not less than 320 lb.; so that the total for the Province is 300,000 gross or 336,000 net tons of pig iron or its equivalent, every pound of which that is not supplied by Quebec and Nova Scotia furnaces is the product of foreign labor. The great bulk of this iron too, as has been shown, reaches us in the manufactured state; only a small proportion of the whole, less than 12 per cent., is brought in as pig iron (a small part of which is cast scrap), and less than one per cent. of it in the form of slabs, blooms, loops and billets. The import of wrought scrap of iron and steel, upon which the rate of duty is only half of the rate imposed on pig iron, has increased in the ten years from 1,327 to 37,034 tons, (equal to 41,150 tons of pig iron, allowing for waste in conversion), so that the quantity of it now used by our rolling mills and foundries is more than all the pig iron smelted in the country. Taking the pig iron and the wrought scrap together, it is the equivalent of 110,068 tons of pig. This is a quantity sufficient if made in Canada to employ five furnaces having the capacity of the Londonderry Iron Company's furnace working at its average of the past nine years, or seven furnaces having a capacity of 50 tons per day and running for 300 days in the year. But it must be admitted that this is a long campaign, to be carried on continuously year after year. In Sweden, where all the pig iron is a product of charcoal furnaces, the average is much shorter, as the following statistics of production for the five years 1886-90 will show:

The bulk of iron imported in the manufactured state.

Imports of pig and scrap iron.

The example of Sweden.

——	1886.	1887.	1888.	1889.	1890.
Furnaces in blast	164	164	162	150	154
Pig iron made, metric tons	442,457	456,625	457,052	420,665	456,102
Total time for all furnaces in blast, days	39,777	40,582	39,840	35,859	37,892
Average daily product per furnace, tons	11.12	11.23	11.47	11.73	12.04
Average time per furnace in blast, days	242.5	247.5	246	239	246

The average campaign of charcoal furnaces in Sweden therefore is only 244 days, ranging in the five years from 242½ to 247½ days a year; and it would require 39 furnaces of the same capacity, running for the same average time, to smelt the pig iron with its equivalent of scrap which is now used in this Province. But the capacity of furnaces aside, there surely is here an opening for iron making in Ontario if all the conditions exist which favor production on advantageous terms. Iron manufactures of various kinds have been carried on for many years in almost all our towns and cities; but the raw material has come from outside sources, with its cost enhanced to manufacturers and consumers by duties, freights and commissions. If it were made at home as cheaply and of as good quality as it can be supplied by the iron masters of the United States and Great Britain it would unquestionably be a great boon, resulting in the opening up of our iron mines, the utilization of our timber for charcoal fuel, the employment of labor, and, it is to be hoped, in the profitable investment of capital. And as the industry became established and strengthened, cost of production would be lowered, iron manufactures would increase in variety and volume, and by degrees Ontario and the whole of Canada might become, as regards the iron industry, a self-contained country.

Advantages of producing the raw material at home.

Quantity and Quality of Ores.

No prudent man is likely to take an interest in iron mining or iron making without first satisfying himself that ores can be procured at points convenient for shipment in sufficient quantities and of suitable qualities for the supply of a furnace.

Evidence of supplies of ores in

In so far as quantities are concerned, it is believed that we have an abundance in Ontario. Indeed the evidence of scientific and practical men, who may be presumed to speak with authority, is that we have an overflowing abundance of ores of different kinds, but the magnetic ore chiefly, owing to the occurrence of this variety in the Archæan rocks. Yet it is never absolutely safe to depend upon surface indications of quantity, and the cautious man would require such further proofs as actual workings or diamond drill explorations can alone in many cases afford. Where a range of ore rises to a great height above the general level of the country and may be traced by exposures for long distances, as in the case of the Atik-Okan and Mattawan, or where level beds are observed extending over large areas, as in the case of the Mesabi, in the northwestern part of the Province, the question of supply can hardly be raised. In the eastern part of the Province however the shows of iron ore occur on a less gigantic scale, and although some of them are proven to be large bodies there are others in which the quantity is very doubtful. There are known cases indeed which in what appeared to be a large deposit turned out to be a mere surface show, to the serious disappointment and loss of parties who had purchased the property. Mining engineers of reputation employed in directing the opening up of veins of gold, silver, nickel, copper and other ores will seldom counsel the building of expensive reduction works until enough ore has been mined to pay for working expenses and cost of the works; and this is safe counsel to follow also in dealing with iron mines and blast furnaces.

northwestern and eastern Ontario.

An unfortunate experience as regards quality.

As regards quality, it has to be confessed that our ores do not enjoy a high reputation with furnace men, especially in the United States. It is true that they have not been tested in large quantity, nor from many mines; but most of the shipments made were unfortunate, being chiefly hard magnetites and high in titanium like the ore of the Chaffey mine, or high in sulphur like the ores of the Glendower and Coe Hill mines. The unsuccessful attempts at iron making in the Province too have added their weight to the suspicion. And so, to use a phrase familiar to iron men, Ontario ores have received a "black eye." In the United States the magnetic ores are also largely impure, being found in some localities high in titanium, in others high in phosphorus, and in others high in sulphur; and as a result of discoveries of very large bodies of clean hematite or specular ores in Michigan, Wisconsin and Minnesota, smaller relative quantities of magnetic ore are used in blast furnaces in that country now than formerly. In 1880 the total output of the iron mines of the United States was 7,120,362 gross tons, of which 2,243,993 tons was red hematite and 3,134,276 tons was magnetite. In 1889 the total production had risen to 14,518,041 tons, whereof 9,056,288 tons was red hematite and only 2,506,415 tons was magnetite, or 62 38 per cent. of the former and 17.26 of the latter. Of other ores, 17.38 per cent. of the whole was brown hematite and 2 98 per cent. carbonate ore. During the decade red hematite had risen from 31.52 to 62.38 per cent, and magnetic ore had fallen from 29.97 to 17.26.[4]

Impure magnetic ores of the United States.

Relative consumption of ores in the States.

Mechanical Treatment of Ores.

Enriching and cleaning ores at the mines.

In a number of instances, Mr. Birkinbine says in the last census report, the ores are treated at the mines to enrich them. Most of the carbonate ores are roasted to drive off the carbonic acid and the sulphurous ores to drive

[4] Report on Mineral Industries in the United States at the Eleventh Census, 1890, p. 7.

off the sulphur, while some of the brown hematites are roasted to facilitate the crushing of lumps or to drive off an excess of water. Washing appliances are used at most of the brown hematite mines to remove clay, sand, etc., from the ores before they are shipped to the furnaces, while jigs are employed to a limited extent for cleaning red hematites and magnetites. "The year 1889," Mr. Birkinbine says, "marked a revival in magnetic concentration, whereby ores carrying smaller percentages of iron than would pay for their exploitation and shipment, or iron ores which have an excess of phosphorus as apatite, or of sulphur in the shape of pyrites, are granulated and passed over various forms of apparatuses in which are currents of electricity or fixed magnets to attract the magnetic material, allowing the non-magnetic to pass away as tailings. This revival in 1889 was confined largely to the construction and equipment of plants for treating ores on a liberal scale, or experiments with various machines under different conditions. As a result of this the amount of such ore produced was small, but subsequently the completion of plants, aggregating a cost of over $500,000, their operation and the results of experiments, made this feature an important one, and one which will probably grow with each year."[5] The amount of iron ore passed through water jigs or magnetic separators in 1889 was 95,425 gross tons, and in 1891 the quantity increased to 98,546 tons of magnetically separated ore and 110,777 tons of jigged ore. In this last year there were 62 magnetic separators in operation in the United States, including machines of the three following classes: (1) Those in which the trajectory of falling material is altered by introducing the attraction of a magnet, to draw the magnetic portion away from the non-magnetic (2) Those wherein the ore is fed to a revolving drum or drums in which is a magnet core, the shells of the drum being either of alternate magnetic and non magnetic strips or entirely of magnetic or non-magnetic material. (3) Belt machines, in which the ore is fed to a belt or series of belts passing under or over magnets or magnetic drums, the machines working sometimes in water and sometimes dry. "There is apparently a wide field for magnetic separation," Mr. Birkinbine says, "especially in the States of New York, New Jersey, Pennsylvania, Virginia, North Carolina and Michigan, where there are large deposits of lean magnetic ores. At first there was considerable prejudice against the use of concentrated ore by some of the blast furnace managers, but this has been largely overcome by practice, which has proven that properly concentrated ore contributes to the good working of the furnace, and in the future this class of ore may be used largely in place of some of the higher-priced ore brought to eastern blast furnaces. This class of ore has also been used in most of the direct processes, and any development of these processes will encourage a corresponding demand for concentrates."[6] It is calculated that the average yield of metal from iron ores mined in the United States in 1880 was 51.22 per cent., and in 1889 51.27 per cent. This is not a high average, or at least it would not be so regarded where, as in Ontario, magnetic ores run up from 60 to 70 per cent. of metallic iron, and even higher; and doubtless it will have the effect of encouraging an enrichment and cleansing of ores by sorting, separating and concentration.

Magnetic concentration of ores.

Classes of magnetic separators in use.

A large field for separators.

Average percentage of metallic iron in United States ores.

Treatment of Ores in Great Britain.

In Great Britain even more than in the United States the impure quality of the ores makes preliminary treatment a necessity. The clay ironstone or carbonate ore which is so abundant in that country is almost all calcined to drive off the carbonic acid and water, as well as portions of sulphur which it may contain; and when so treated it yields only about 30 per cent. of metal. In the case of phosphorus it is quite exceptional, Sir Lowthian Bell observes, when any material treated in a blast furnace is abso-

Calcining the carbonate ore.

General prevalence of phosphorus.

[5] Report on Mineral Industries in the United States at the Eleventh Census, 1890, p. 12.

[6] Mineral Resources of the United States, 1891, p. 43.

lutely free from it; the fuel, flux and ore all appear to contain it in greater or less quantities. "Beginning with the oxides of iron found in the granite formation and ending with the lake ore forming at the present day, this element is almost invariably present. It occurs almost always combined with oxygen as phosphoric acid, in the form of phosphates of iron or lime in the ore, or as phosphate of lime in the flux and fuel. When a phosphate of iron or lime is exposed to a high temperature in contact with carbon the oxygen is separated from these salts and the product is phosphide of iron or phosphide of calcium The pig iron then dissolves the phosphide of iron, or decomposes most of the phosphide of calcium Thus it unfortunately happens that by far the largest quantity of this substance, as it occurs in the materials, is taken up by the iron."[7] In this way it happens that of the whole of the phosphorus existing in the materials not less than 90 per cent., it is calculated, finds its way into the iron.

THE INJURIOUS ELEMENTS IN IRON.

Ontario ores not exceptional.

It is evident therefore that in other countries as well as in Ontario the iron ores are impure and give rise to difficulties which are not easily overcome. But the fact that they are overcome in a large measure and that new and improved processes are being tested and introduced from time to time strengthens the belief that there is nothing in the character or quality of our Ontario ores to cause them to be regarded as in any material respect inferior to ores elsewhere.

Titanium.

Phosphorus and its effects.

Of the three most injurious elements, viz: phosphorus, sulphur and titanium, the first named is not usually found to exist in injurious proportions in iron ores of the Archæan rocks, while the last named does not as a rule occur in combination with either of the other two. Phosphorus is objected to because it makes iron "cold-short," that is to say it is brittle when cold. It is the steel-maker's bane. "Phosphoric iron," Howe says, "is readily broken by jerky, shock-like or vibratory stresses, sometimes when quite trifling; it is treacherous. It sometimes affects iron but slightly, sometimes under apparently like conditions profoundly; it is capricious. It unusually increases the elastic limit, thus raising the elastic ratio, an index of brittleness. It diminishes also the elongation and contraction on rupture, two other measures of ductility affecting this property like tensile strength much more under shock than under quiescent stress."[8] One of its most obvious physical effects is to induce in iron or steel a coarsely crystalline structure, and this is supposed to be the cause of brittleness in the metal.

Effect of sulphur in iron.

The effect of sulphur is to produce "red-shortness" in iron or steel, that is to say brittleness at a red heat, while for the foundry it hardens the metal. "It is thought to make malleable iron slightly tougher and softer when cold but to make cast iron harder, though this latter effect is at least in part due to its causing it to retain the carbon in the combined state. It increases the fusibility of cast iron, but makes it thick and sluggish when molten and gives rise to blow holes during its solidification."[9] Its action is generally most noticeable at a dull red heat, but when present in only small quantity the iron is readily forged at high temperatures. If however the percentage is high the iron is no longer malleable at high temperatures.

Effect of titanium.

One serious objection to titanium, upon which all authorities are agreed, is that it gives rise to a pasty and viscous slag in the blast furnace, which, besides being non flowable when tapped, forms "bridges" in the furnace which interfere with its working. But as to its effect on the quality of iron, opinions differ. By some it is said to give hardness, toughness and strength to the metal, and that under no circumstance is the iron "cold short" or "red-short." Other authorities again, like Howe, while admitting that it

[7] Principles of the Manufacture of Iron and Steel, p. 165.

[8] The Metallurgy of Steel by Henry Marion Howe, p. 54. [9] Ib. p. 49.

often occurs in gray soft iron, affirm that the metal is so oxidizable as to make it a matter of extreme doubt if it ever exists in wrought iron or steel.[10]

Recent improvements in methods of treating ores and metallic iron.

Some of the methods of treating iron ores and metallic iron containing those hurtful elements are old and well known, while others are of recent adoption and have barely passed the experimental stage. Cobbing, roasting and washing are methods easily applied to all ores, and lime is an excellent agent in carrying off a percentage of sulphur when used as flux in the charge of a blast furnace. Magnetic separators are only useful when applied to magnetic ores which have been reduced to powder by crushing or milling. They not only enrich the ores by separating the earthy or rock matter from the oxide of iron, but also by separating such parts of phosphorus, sulphur and titanium as are not chemically united with the oxide of iron, which sometimes is a large percentage of the whole. Machines of various designs, as already shown, have been constructed for this purpose, and some of them appear to be well fitted for doing their work effectively and economically. But most of them are of recent invention, and doubtless their working will suggest important improvements both in utility and in economy.[11]

Smelting Titanic Ores.

Rossi's investigations and experiments.

Experiments conducted last year with titaniferous ores by Auguste J. Rossi of New York afford grounds of assurance that the titanium difficulty may further be overcome in blast furnace practice. Mr Rossi learned that ores of this class containing from 10 to 20 per cent. of titanic acid had been successfully smelted in large quantity in the Adirondack mountains, in New

[10] On page 85 of his valuable work on the Metallurgy of Steel Mr. Howe says titanium can probably only be introduced into any malleable variety of iron by a tour de force, nor is there reason to believe that if introduced it would be beneficial. On page 369 he refers to two samples containing a small proportion of titanium, but having a high percentage of carbon. By others it is claimed that the titanium may have an excellent indirect beneficial effect on wrought iron and steel, even when little or none of it is found in them, when they are the product of pig iron smelted from titaniferous ores.

[11] An interview with Thomas Edison in McClure's Magazine for June, 1893, pp. 37-8, under the title of Unsolved Problems that Edison is Studying, gives the following interesting account of the attention which that inventor is giving to the perfecting of his methods for treating lean or impure magnetic iron ores: "The most important of the campaigns I have in mind is one in which I have now been engaged for several years. I have long been satisfied that it was possible to invent an ore-concentrator which would vastly simplify the prevailing methods of extracting iron from earth and rock, and which would do it so much cheaper than those processes as to command the market. Of course I refer to magnetic iron ore. Some of the New Jersey mountains contain practically inexhaustible stores of this magnetic ore, but it has been expensive to mine. I was able to secure mining options upon nearly all these properties, and then I began the campaign of developing an ore-concentrator which would make these deposits profitably available. This iron is unlike any other iron ore. It takes four tons of the ore to produce one ton of pure iron, and yet I saw some years ago that if some method of extracting this ore could be devised, and the mines controlled, an enormously profitable business would be developed, and yet a cheaper iron ore—cheaper in its first cost—would be put upon the market. I worked very hard upon this problem, and in one sense successfully, for I have been able by my methods to extract this magnetic iron ore at a comparatively small cost, and deliver from my mills pure iron bricklets. Yet I have not been satisfied with the methods; and some months ago I decided to abandon the old methods and to undertake to do this work by an entirely new system. I had some ten important details to master before I could get a perfect machine, and I have already mastered eight of them. Only two remain to be solved; and when this work is complete I shall have I think a plant and mining privileges which will outrank the incandescent lamp as a commercial venture, certainly so far as I am myself concerned. Whetever the profits are, I shall myself control them, as I have taken no capitalists in with me in this scheme."

'Mr. Edison was asked if he was willing to be more explicit respecting this invention, but he declined to be, further than to say':

"When the machinery is done as I expect to develop it, it will be capable of handling twenty thousand tons of iron ore a day, with two shifts a day, five men in a shift. That is to say ten workmen, working twenty hours a day in the aggregate, will be able to take this ore, crush it, reduce it to cement-like proportions, extract it from the rock and earth, and make it into bricklets of pure iron, and do it so cheaply that it will command the market for magnetic iron."

When Mr. Edison speaks of "pure iron" in the last sentence, he no doubt means pure oxide of iron.

York State, some fifty years ago, and after as full an investigation of the records of those furnaces as was available, he proceeded to make laboratory tests along the same lines. The success of the furnaces appeared to have been due largely if not wholly to the use of certain kinds of flux in the charge which give fluidity to the slag, and the problem seemed to Mr Rossi to be, to produce with titanic acid a slag fully as fusible as those admissible in blast furnace practice. In carrying out his line of experiments the aim was to operate at not too high a temperature, so that if sufficient fusible and fluid compounds could be obtained in the crucible they might then be reproduced in a blast furnace with still greater ease. Some of the experiments were made with ores, but whenever it was intended to work for a certain type of titanate no ore was used. "Titanic acid was furnished by rutile completely analysed beforehand, and the bases were supplied by adding caustic lime, magnesia, alumina and silica, chemically pure, tested each time before weighing them for such water or carbonic acid as might have been absorbed in the intervals of two experiments by some of the chemicals, such as caustic lime and silica." These bases tested in various proportions gave slags of varying qualities, careful analyses of which were made and recorded. The ores, fluxes and fuel were intimately mixed in the crucibles, having been previously reduced to powder. The results varied much according to the mixtures. In some a good liquid slag was obtained which ran out freely, while others were pasty, chilling quickly and being sluggish and lumpy in flow. Among the general results noticed were, (1) that the presence of a large quantity of magnesia and lime, without alumina, tends to diminish the fusibility, and the addition of alumina renders the slag more fusible and fluid, and (2) that the absence of magnesia, if the percentage of alumina and lime be high, with only five per cent. of silica, has a similar effect on the fusibility, the addition of magnesia increasing the fusibility and fluidity.

Aim of his experiments

Laboratory tests for flux.

General results.

Testing the results in a blast furnace.

The question which then arose in the mind of the experimenter was, Could such slags be reproduced in the conditions of working of a blast furnace? Could like compounds be obtained and the iron of the ore be separated from its gangue when the materials were charged into the furnace in lumps and by distinct layers as is the common practice, instead of previously being reduced to powder and intimately mixed as was done in the laboratory? "Nothing but a direct experiment being capable of deciding this question," Mr. Rossi says, "we built a small furnace for the purpose, assuming that if, even on such limited scale with a blast hardly at 300° or 400° F. and a pressure of not over two pounds, we could obtain the calculated slags from highly titaniferous ores with no other flux than limestone (dolomitic), the materials being charged in lumps, in proper relative proportions and in layers at regular intervals, and at the same time obtain pig iron, it would be possible in industrial practice, with a better distribution of heat, a greater height of furnace insuring a complete and thorough reduction of ores, to obtain results of the same kind and even much more favorable. Slags of a more extreme composition or basicity, for instance, though found less fusible in our experiments, might become admissible, though neither advantageous nor neccessary." Accordingly a small furnace was built and tested with a view of proving upon a large scale the results obtained in the laboratory: but as this furnace was only 9 feet in height, with hearth of 12 inches and bosh of 28 inches diameter, it could not be expected to show working of a very satisfactory character. With a light charge of ore in the stack it was only natural that the iron should lose its liquidity in the small hearth; and this is just what did happen, for after rising to the tap-hole it chilled on the run. The slags however kept very fluid from the first tapping, flowing freely on the run to 10 feet from the furnace without chilling, and so continued as long as the blast was maintained. "We do not claim that everything has been settled definitely by this experiment. But it has been possible to obtain from ores

Capacity of the test furnace.

containing some 20 per cent. of TiO_2 in a continuous manner, under the conditions of working of a furnace and on a scale certainly unfavorable to good reduction of the ores and a proper distribution of heat in the different parts, both slags and pig iron. The slags showed good fluidity and fusibility, though containing, some, 25Ti O_2 to 22si O_2; others 40Ti O_2 to 22si O^2. and some 35Ti O_2 to 14si O_2, with magnesia, alumina and lime as bases. No other addition of fluxes to the ores and coke was required than limestone (dolomite and calcite mixed, pure lime having been once resorted to for want of calcite); and the consumption of materials (certainly of flux, and even of coke, considering the dimensions of the furnace), was fairly economical for a 51 per cent. iron ore, viz, ore 50, coke 50, stone 21."[12]

What is claimed for the furnace test.

Two considerations should lead us to attach great importance to the tests made by Mr. Rossi, especially in view of the success which appears to have attended them. One is, the vast bodies of titanic ores in Canada and the United States, which are at present valueless owing to the hitherto insuperable difficulties of treating them in the blast furnace. The other is, that while many of such ores are found to be rich in iron they are generally free from phosphorus, and frequently also from sulphur.

Importance of the experiments.

Elimination of Phosphorus.

The presence of phosphorus in iron threatened for a time to defeat the process of Sir Henry Bessemer for the conversion of iron into steel. Even so low a proportion as one-thousandth to two-thousandths of one per cent. suffices to make iron or steel "cold-short," and most of the British ores carry phosphorus. In 1872, seventeen years after the date of Bessemer's invention, Mr. Snelus tried the plan of lining a converter with lime, the effect of which was to reduce the phosphorus in the pig iron; but for some cause he failed to prosecute his experiments. The idea was taken up a few years later by Messrs. Thomas and Gilchrist, two young science students of London, and by using a mixture of magnesia and lime for the lining they obtained gratifying results. But where the proportion of phosphorus was high in the iron it was found that the lining alone was not sufficient to carry out the work of dephosphorization. Accordingly they added a quantity of lime to the charge, and so improved the operation as to succeed in removing 96 per cent. and over of the phosphorus initially present. This is known as the basic process, in which dolomite, a basic earth, is used for the lining, to distinguish it from the acid or common Bessemer process, in which silica is the material used for the lining. In America the basic process has not met with much favor, owing it may be supposed to two causes—one being the comparative purity of the ores, and the other the royalty charge for the use of the process.[13] The total quantity of Thomas steel produced since its manufacture was initiated is by latest accounts 19,532,000 tons, whereof 11,452,000 tons is credited to Germany. The total output of Thomas steel last year was 3,202,000 tons, of which quantity Germany and Luxemburg produced 2,013,000 tons. A valuable bye-product of this process is the slag, which consists chiefly of lime and phosphoric anhydride, both of which are valuable fertilizers. The quantity of slag made in 1889 was 600,000 tons according to Gilchrist, and it contains 17 per cent. of phosphoric anhydride and 60 per cent. of lime, which sold at 20s. to 30s. per ton at the works. For sour, peaty and clay soils it is a fertilizer of great value, but for calcareous soil it is not valuable. "It is interesting to note," Prof. Roberts-Austen says, "that

Introduction of the basic process.

Production of Thomas steel.

Value of the slag as a fertilizer.

[12] Mr. Rossi's paper giving an account of his experiments with titaniferous ores was read at the meeting of the American Institute of Mining Engineers held at Montreal in February of this year.

[13] The Thomas-Gilchrist patents expire next year, when a considerable development of production by their process is looked for; indeed is feared. Mr Thomas died a few years ago; but Mr. Gilchrist, who is not yet forty years of age, is said to be a millionaire in pounds sterling.

the phosphoric anhydride is combined with the lime in an unusual manner. Instead of being an insoluble tri-basic phosphate, it is a readily soluble tetra-basic phosphate, and if it be finely ground the phosphorus it contains is readily assimilated by plants. At first attempts were made to treat it by various chemical methods, but it has been found best to simply grind and use it in fine powder."[14]

The basic process, it may be observed, is applied to the refining of pig iron, and mainly for its conversion into steel.

No method of eliminating phosphorus from the ore in the blast furnace has yet been discovered; and as to the preparatory treatment of ores containing phosphorus the magnetic separator has no doubt given the best results.

Desulphurizing Metallic Iron.

The puddling process.

There are various porcesses for desulphurizing iron ores, as has been pointed out; and in the furnace a generous use of lime is highly serviceable. By puddling and by the basic process, which are essentially the same, sulphur is expelled from iron, and manganese is also a powerful agent for its removal. But after all these processes have been tried a residuum of sulphur often remains. It is not merely the sulphur in the iron ore which has to be combatted, but the sulphur in the coal or coke as well, whereby the percentage in the pig or cast iron is increased; and various devices have been tried by metallurgists to get rid of it. The importance of obtaining a suitable method has indeed become more pressing than ever before, owing to the more general use of steel which followed the introduction of the Bessemer process. During recent years a special study of the desulphurization of iron has been made, and careful experiments have been carried on by a number of well known men upon scientific lines; but while some progress has been attained there are only two processes which deserve special mention here, and both treat the iron after it has been reduced from its ore.

Growing demand for better processes.

Operation of the Hoerde process

One of these is the invention of Joseph Massenez, a German, and is known as the Hoerde process because it was first tested on a large scale at that place. It aims at the removal of sulphur from iron by the agency of manganese—iron high in sulphur and poor in manganese being mixed with iron containing a large percentage of manganese and little sulphur. The result is that the manganese of the one charge acts upon and combines with the sulphur of the other, forming a manganese sulphide which rises and flows off in the slag.[15] The mixer is a vessel with a capacity of 120 tons, into one end of which the molten pig iron is poured as brought direct from the blast furnaces, along with a certain amount of ferro-manganese, while from the other end the desulphurized metal is poured into ladles and taken to the Bessemer converters which are used in conjunction with the process. About 1 7 per cent. of manganese is added to the charge, whereof 0 2 per cent. combines with the sulphur, the rest remaining in the iron. One effect of the mixing, it is claimed, is to give steel of more even quality when the operation is completed in the converters. The process appears to be well approved in Germany, and it has recently been adopted in two of the largest steel-making establishments in Great Britain.

Operation of the Saniter process.

The other process to which reference has been made, a later than the Hoerde, is the invention of Ernest H. Saniter, chemist of the Wigan Coal and Iron Co. of England It is thus described by Mr. Saniter himself:

"A mixture of calcium chloride and lime is prepared, which will fuse readily at the temperature of the iron to be operated upon. The desired combination is made by grinding calcium chloride and lime together in a mill

[14] An Introduction to the Study of Metallurgy, p. 224.

[15] J. E. Stead in the Journal of the Iron and Steel Institute No. II. 1892, p 258.

so as to thoroughly mix them, and also to bring them to a moderately fine powder. About equal parts of each are required to give the desired fusibility. This mixture is then placed on the bottom of a ladle or receiver, and consolidated by heat, or kept in position by other suitable means. The heat may be applied in the first instance by means of a blow-pipe arrangement, using blast-furnace gas, but when in continuous use the heat of the ladle itself is quite sufficient. The receiver is then filled with iron, which may be drawn direct from the blast furnace, the heat of which melts the mixture, and the latter, rising up through the metal, removes the sulphur very completely. I do not find it necessary to have reducing conditions, and indeed oxidation may be going on concurrently with the removal of the sulphur, as will be seen later on. Notwithstanding this however the sulphur is removed as sulphide. Should it be desirable to remove silicon as well as sulphur, the lime of the mixture is replaced by hydrate or carbonate of lime, or even oxide of iron in addition should the hydrate or carbonate be insufficient. About 25 lb. of chloride of calcium and an equal weight of lime per ton of iron have been found sufficient to effect purification.'[16]

For removing silicon as well as sulphur.

In a number of experiments made with the Saniter process it was found that 73.6 per cent of the sulphur and 35.77 per cent. of the silicon contained in the iron were eliminated, and the whole cost of materials was only twelve cents per ton. The process was carefully investigated last year by Mr. Stead and the results as given by Mr. Saniter were fully confirmed by him, as set forth in a lengthy paper read before the Iron and Steel Institute at its Liverpool meeting of September last year.

Results obtained

At the meeting of the Institute held in London on the 25th and 26th of May of the current year Saniter's process was again the chief subject of consideration, when papers on it were read by Messrs Stead and Saniter. Mr. Stead's paper was occupied largely in meeting German criticisms of the process; for it is to be observed that in Germany, according to some metallurgical authorities, the process meets with difficulties in practical use which are not present in the Hoerde method.

Further tests of the Saniter process.

Mr. Saniter's short paper reaffirmed the results previously obtained after six months' further experience of the process. The Wigan Coal and Iron Company, with whom Mr. Saniter is employed, has laid down a plant for dealing with the whole make of a blast furnace, the general arrangements of which are that the sand bed has been lowered to the ground level, whereon and in front of the blast furnace is a ladle on a carriage, the ladle being provided with tipping gear. The ladle is heated before the first operation and the mixture of calcium chloride and lime is put on the bottom, protected with a small cast iron plate to prevent the molten metal cutting under it. The metal is then run in and as soon as the reaction ceases it is tipped into the lowered sand bed and the slag is raked out of the ladle. The quantity

Plant for operating the process.

[16] Journal of the Iron and Steel Institute, No. II. 1892, pp. 217-18. The London Engineer of May 5, 1893, writing of Saniter's method says:

"In point of cost—and the commercial aspect of an invention must always override all others—the new process compares very favorably with the Massenez process, which may be considered its principal if not its only rival. The cost of the materials used in the former case appears to be from 6*d*. to 9*d*. per ton of pig iron, or 1*s*. per ton including royalty and labor, as against from 1*s*. 6*d*. to 2*s*. 6*d*. for materials only in the latter case. The cost of calcium chloride, if applied in the converter or open hearth, is about 9*d*. per ton of steel, and this expenditure is said to effect an actual saving of about 4*s*. per ton of ingots by the reduced consumption in ore and scrap.

"The only special plant required for Saniter's process is a reverberatory furnace for drying the calcium chloride, some apparatus for pulverizing the same and mixing it with lime, and a tipping ladle. The latter is dispensed with if desulphurization is effected in the converter or the open hearth

"There is at present an almost unlimited supply of calcium chloride, it being a by-product resulting from the manufacture of soda and bleaching powder. Its present value is about 35*s*. per ton. Not more than ten per cent. of the total quantity produced is utilised, and a new use will be very acceptable to the makers. There is of course no difficulty in obtaining plentiful supplies of limestone and lime."

treated at a cast is nine to twelve tons, the cost of the plant is under £250 per furnace, and the cost of materials is 4*d.* and of other cost including labor and grinding 2*d.* per ton of iron treated.

Used in the basic converter also.

The process is applied not only to the treating of iron as it comes from the blast furnace, but also for its conversion into basic steel; and it is claimed by Mr. Saniter that while a basic Bessemer blow alone will get rid of about 45 per cent. of the sulphur, his dual process (first in the ladle and afterwards in the converter) will get rid of 78 per cent. The steel made by his process, Mr. Saniter claims, has been tested in Sheffield for the various purposes for which Swedish bar is used in making the highest class cutlery and tool steels with marked success. "It has also been found nearly equal to the best charcoal iron for conductivity purposes. It welds splendidly. A piece which had been welded was turned and pulled in the testing machine; it broke clear of the weld, the line of which it was impossible to detect."

Quality of the steel product.

Testimony of Mr. Snelus to the value of Saniter's new process.

But perhaps the most valuable testimony to the worth of this process is one furnished by Mr. George J. Snelus, vice-president of the Iron and Steel Institute, whose authority as a scientific and practical metallurgist is cheerfully recognized throughout Europe and America. The following extract is taken from Mr. Snelus' report upon the Saniter process, which was read at the last meeting of the Institute:

His report on experiments.

"I spent two days, February 21 and 22, in personally examining the working of this process at the works of the Wigan Coal and Iron Company. Every opportunity was afforded me for investigating the process from beginning to end. All samples were taken and carefully labelled by myself, and these were analysed with extreme care in my own laboratory. I had some ingots from the Siemens cast c.1134 heated on the second day and rolled into two-inch billets. These were afterwards rolled into $\frac{5}{8}$ round bars, and tested for tensile strain in my presence. The ingots were twelve inches square, weighing 16 cwt. They were heated (from cold) in 1 hour 20 minutes, and rolled off in twelve passes in the roughing rolls to nine passes in the finishing rolls. I was remarkably struck by the fine quality of the steel. I could not detect the slightest flaw or sign of red-shortness in any of the ingots or in the finished billets, although I examined them minutely. In fact I never saw any steel roll cleaner or better than this did, and the practical tests fully corroborate the analytical results which follow, and show clearly that this process is most effectual in desulphurizing the commonest kind of pig iron to such an extent that the highest class of steel can be made from it. The materials employed are not costly, and there is no difficulty in carrying out the process and in producing uniformly good results.

"The process is adapted either for purifying fluid pig iron direct from the blast furnace, by running the fluid metal into a ladle having a layer of the purifying materials on the bottom, and afterwards running the metal into pigs or plate metal for subsequent use in the puddling furnace, etc.; or the crude sulphury pig is treated in the basic Siemens furnace or Bessemer converter with the patented mixture, as in the casts c. 1134 and c. 1135. Calcium chloride is the purifying material in admixture with lime. This at present costs 35s. per ton packed in own drums f. o. t. St. Helens or Widnes. It is made by the United Alkali Company from residues of the Weldon process, and containing 70 per cent. absolute calcium chloride, 1 to 2 per cent. impurities, and balance water. It is dried in rough iron dishes in a reverberatory furnace before use. In purifying the metal in the ladle, fluor spar is sometimes mixed with the calcium chloride to retard the process, and some limestone is used to save lime and produce a boil in the ladle. Fluor spar can also be used with the other ingredients, lime, limestone and purple ore in the ladle, but the mixture is not quite so efficient as when calcium chloride is used."

Full details of his experiments are given by Mr Snelus, both in desulphurizing in the ladle and converting into steel, together with analyses of the metal and slag at the various stages of steel making, and also the mechanical test of the steel, and the result of his observations is summed up in these words: "That this is a thoroughly practical, reliable and inexpensive process for desulphurization, and that by it, using the basic process, white iron made entirely from cinder can be converted into excellent steel without undue waste or loss of time." The result.

In the discussion by members of the Institute which followed the papers, Mr. Snelus stated that he had an opportunity of seeing the process at work on a practical scale and that it was not now merely an experiment. He confessed that he had gone to the place with some fear and trembling; he thought it was in an experimental stage; but when he went there he found that it was in full working order, applied constantly to a blast furnace of ordinary capacity, running in the ordinary way and the whole thing going on as a large manufacturing operation. It was simply an examination of a process going on in ordinary working—a thing carried on daily by ordinary workmen without any instructions, but of course the men must be skilled and possess a full knowledge of the process and how to adapt it. Mr. Snelus said he had often been condemned by his friends for having ruined his own district, in which is hematite ore high in sulphur, by doing all that he could for dephosphorization; but he hoped that he should atone somewhat for that by the aid which he would give to desulphurization, because it would place in the hands of hematite makers a means of producing the very highest class of steel. Therefore he thought that the process would undoubtedly be a benefit to those districts having the class of ore in which sulphur had been a trouble as well as phosphorus. The process is by the experimental stage, and in full working order. The process a boon to British hematite ores.

Of course there was not entire agreement among members of the Institute on the merits of the Saniter process, and doubts were expressed by one or two members as to whether it could be depended upon for uniformity of results. Sir Lowthian Bell was characteristically cautious; that is a constitutional quality with him, and he is to be respected for it. But Sir Lowthian discussed the subject mostly from the point of view of a theorist, for he had not had an opportunity of examining the process in practice; and it is to be stated that the German objectors have also in the main spoken and written from the same point of view. Such testimony cannot therefore have the same weight or value as the testimony of men like Mr. Snelus and Mr. Stead, who have made careful study of the process after witnessing its operation.[17] Practical demonstration, in which there is not a possibility of deception, will be accepted in preference to the most ingenious speculation or theory. Differences of opinion.

[17]See Report of the Proceedings of the Iron and Steel Institute in Iron, May 26, 1893. At a meeting of the Cleveland Institution of Engineers held December 19, 1892, Mr. Saniter read a paper descriptive of his process in which he said:

"The application of the process to the manufacture of basic pig iron presents in the first instance the possibility of dispensing with the use of expensive manganiferous ores, and the further possibility of removing the difficulty hitherto experienced in using direct metal for steel making, owing in the one case to high silicon and conversely when the silicon is low to high sulphur. This may be simply done by using the dry mixture for the removal of sulphur only, and should the silicon be high by adding a bucket of water to the mixture a short time before tapping the furnace." Commenting on this feature of Mr. Saniter's paper at the meeting, Mr. Stead said there seemed to be at the present time a rage for studying how to get rid of sulphur. It is not so long ago, he said, that a beautiful process was perfected in Germany, but it required a large amount of manganese, which is expensive. At Wigan he had witnessed successful experiments on Mr. Saniter's process with iron containing only 0.4 per cent. of manganese, and though the sulphur was 0.4 per cent. it went out almost magically a few minutes after the chloride of calcium was added. They did not understand exactly what action took place, but the fact remained that the sulphur was eliminated, and in the course of time they would no doubt understand the action itself.

LESSONS FOR ONTARIO.

Progress of improvement in methods of treating ores and metallic iron.

The long story of invention is not closed, and in so far as the art of iron making is concerned it is not likely to close while impurities in ores and fuels continue to baffle the ingenuity of man. But the iron masters are in the line of improvement, and aided by science they are making sure headway in the face of many difficulties. The iron ores of Ontario are no worse than ores elsewhere; indeed it is almost certain that they are freer from at least one objectionable element, phosphorus, than those of other countries in which supplies are mostly found in the more recent rock formations. Better ways of treating ores in preparation for the blast furnace, and better ways of improving and refining iron and converting it into steel, as well as of strengthening it in combination with other metals, are being found out by skilled men in the laboratory, the furnace and the workshop; and every advance so made is a gain in which the whole world may share. There is not a process in the preparation and smelting of ores, not an improvement in the blast furnace, not a method of refining or working the metal, not an economy in any operation from opening the mine to the last touch of finish in the workshop, but is as free and open to us in Ontario as it is to the people of any country or state in Europe or America. Why then should not effort be directed to utilize one of the most valuable of all the raw resources of our country, converting it into wealth by the wisely-controlled agencies of capital and labor, and making it an instrument for the production of greater wealth by ways and means almost without limit and number? A talent kept buried in the earth will be no more than a talent a hundred years hence, while if rightly utilized it may reproduce itself a thousand fold in a hundred years.

The buried talent.

V.

FACTS AND OPINIONS ON THE IRON INDUSTRY.

The narrative of the failures and successes of iron making in our country, of the means which have been adopted by Governments to aid and encourage the industry, of the iron ore resources of our Province and of improved methods for treating ores in the process of extracting the metallic iron, may now be appropriately followed with information and opinions gathered in a wider field, but having direct reference to the possibilities of establishing works for the production and manufacture of iron in Ontario.

Various Aspects of the Industry Presented.

In the statements which follow, Dr. A. P. Coleman, Professor of Metallurgy and Assaying at the School of Practical Science, treats of the development of our mineral resources in a general way; Samuel D. Mills gives the benefit of his experience with charcoal furnaces in Michigan and Texas; Mr. Ritchie outlines a scheme for utilizing iron ores along the line of the Central Ontario Railway in connection with nickel ores of the Sudbury district; and Messrs. Pusey, Ledyard and Conmee express opinions on a variety of practical features relating to the industry.

Professor Coleman's Statement.

Coleman.

"From a geological point of view the Province consists of a comparatively small southern portion formed of paleozoic rocks with no important deposits of minerals, but covered by as productive soil as any in America, and of an immense northern and northwestern area of Laurentian and Huronian rock, of little use for agriculture, but rich in mineral resources. The fertile southern portion was naturally settled first by a thrifty, prosperous agricultural population, little inclined to unusual speculations of any kind and specially ignorant of mines and minerals. Losses in the Madoc gold mining excitement confirmed them in the belief that mines, especially in Ontario, were very dangerous investments.

Agricultural and mineral wealth of the country.

"As an agricultural country Ontario has practically reached its limit. If the Province is to advance in the future as in the past, or if it is not to retrograde even, the great northwest must be turned to advantage. Its stores of timber have hitherto been a source of revenue, but fires and the work of the lumberman are steadily diminishing them. The only hope for rapid advance in the future lies in the development of the mineral resources, especially of the Huronian tracts, which as far as explored have proved rich in ores. Iron ores of unsurpassed quality and in large amounts are found in the Province; copper ores occur in very large quantities; and the world's largest known source of nickel belongs to the Province, not to mention ores of silver and gold; so that Ontario may justly be described as one of the richest countries in the world in mineral resources.

"Notwithstanding this, Ontario has been disappointingly slow in developing its mines, and what has been done has been the work not of Ontario men, but of Americans or Europeans, and has frequently been carried on in ways unsuited to our conditions. Every new mining region has its special conditions and difficulties, and the best methods of meeting them can be determined often only by costly experiments on a commercial scale. No mining region can reach the highest prosperity merely by shipping its ores to other countries,

Coleman.

and it is safe to say that until Ontario ceases to sell its ores and low grade mattes and begins to smelt and refine its own iron, steel, nickel and copper, no great advance is likely to be made. The establishment of smelting works of any kind on the right scale and wisely managed will give a market for many ores of too low grade for export, and will serve as a nucleus for a dozen other industries of great importance.

Advantages of smelting works.

"The starting of the manufacture of good quality steel, for instance, would probably be followed by the refining of at least part of our own nickel, to be used in making nickel steel, and that by the refining of the associated copper. I need not say that this would imply a demand for skilled and highly paid labor, would lead to the building up of great manufacturing centers through the cheapness of the main raw materials, and would afford the best possible markets for our farmers.

Skilled labor and good markets.

"But the founding of such metallurgical establishments on the proper scale demands a large capital and great experience; and at the outset there would probably be little or no returns until the experimental stage was over. In many other countries this costly and discouraging initiatory period has been tided over by governmental aid until things had reached a self-supporting basis.

Capital and experience required,

"In a purely agricultural country like Ontario encouragement is particularly needed, since our people have not yet developed the skill and experience required for success in this direction; and the foreigners who might be expected to undertake the work are already interested in the success of rival establishments in the United States, England or other countries.

"Under all the circumstances it appears that our Government would be justified in aiding in whatever way seems wisest the establishment of smelting works in the Province, such aid of course to cease when no longer needed. Such a course has been adopted with advantage by many other countries. Norway and Saxony have even owned and worked important mines and smelting establishments with great benefit to the State.

which ought to be encouraged by Government aid.

"In my opinion Ontario has reached an important turning point in its history. If no new departure is made our Province must stand still or even retrograde, while a wise utilization of our mineral resources will give the starting point for a growth of population and wealth which will keep Ontario in the front rank as compared with the rest of the world.

A turning point in our history.

"To the Government of Ontario this question has a very direct importance from the financial side. The revenues now derived from the sale of timber limits will not last always; but if mining and smelting receive the proper attention this loss of revenue may be much more than made up in royalties."

Financial aspect of the question.

SAMUEL D. MILLS' STATEMENT.

Mills.

"I am an old countryman by birth. I studied at the Royal School of Science, Dublin, intending to follow mining engineering, but family circumstances led to my abandoning that idea, and for seven years I did nothing at it. I formerly resided in Kingston, Ontario, for nearly four years. I have had no experience in iron-making in Canada. During the time I lived in Nova Scotia, about three years, I was a partner in a private company engaged in mining barytes but owing to some changes in the market we could not work at a profit, and, there being indications of lead, copper and silver on the property, I was engaged in attempting to develop these. I lived in Nova Scotia from 1874 to 1877, and took advantage of opportunities I possessed of visiting and studying the working of the furnaces at Londonderry. Mr. Brown, the general superintendent, being a friend of mine, proposed that I should take the position of chemist and assistant superintendent, but a change in the management prevented my doing so. When I went to Kingston I opened a mineralogical and mining office, and remained there for three years trying to work up some interest in connection with the mines there. I examined many of the mines in that district at that time. I examined the iron mines north of Kingston, in Frontenac principally, and

also in Lanark and other parts of that country. I was partly exploring for my own purposes and partly examining for others. Folger Bros. got me to go up and make a report on the Mississippi iron property, and I examined some mines farther north for my own satisfaction; these mines were being worked then. I wrote a report for Messrs. Folger which was published in the Kingston Whig at the time, somewhere about 1879 or 1880. Mills.

"In 1881, finding that business continued dull, and it was impossible to get up any interest in mining at Kingston, I abandoned the attempt. I got an offer to go to Michigan to take charge of the new chemical works and blast furnace at Newberry, in the northern peninsula, about 75 miles from the straits of Mackinaw. I remained there for nine months, when I went to St. Ignace and took charge of the Martel furnace and chemical works, where I remained for about eight years. The St. Ignace furnace was built before I went there, and had been running about eighteen months. The supply of ore for this furnace came from many different mines in Michigan, mostly from the neighborhood of Ishpeming. Some of it came by rail a distance of about 165 miles. We used a mixture of ores. During the last fifteen months I was there we experimented with thirteen different kinds of ore, showing the range of ore obtainable there. We used brown hematite, a certain proportion of red hematite, hard specular and magnetic ore. When I speak of red hematite I mean both the soft, earthy variety and the hard specular ore. The regular practice in that furnace was to use a mixture of five different kinds of ore in the same charge, mixed in given proportions. In the manufacture of car-wheel iron the obtaining of a proper quality of chill is a matter of very great nicety, and one requiring very close attention, and the mixture of the ores was made with the view of accomplishing that object. We experimented carefully so as to find out the proper mixture, and the proportion of the various ores was regulated accordingly. We never tried to produce a suitable quality of iron from magnetic ore alone, as we had no occasion to do so. It would not have been economical, because the magnetic ores were the highest priced ores we used. We used only a small proportion of them, what we could not do without. The bulk of the ores were hematite, chiefly red.

Blast furnace experience in Michigan.

The St. Ignace furnace.

"During a run of 167 days from April to October, we experimented on the following varieties of ore:—Imperial, a brown hematite; Webster, the same; Cleveland Lake, a soft red hematite; Old Mine, a similar quality of ore; Cleveland Scotch, Dexter, East New York No. 2, and Lake Superior No. 1, all hard red hematites; Michigamme and Comrade, magnetic ores. The names given are those of the mines. Some of the hard red hematite ore was specular. The following are the quantities we used during that campaign:—Imperial, 3,405 tons, Webster, 115 tons; Cleveland Lake, 3,722 tons; Old Mine, 2,369 tons; Cleveland Scotch, 3,668 tons; East New York No. 2, 622 tons; Lake Superior No. 1, 954 tons; Michigamme, 1,016 tons; Comrade, 91 tons, and Chelsea, 99 tons. The average yield of iron for the 167 days was 57.8 per cent. The mixtures did not remain the same for the whole time; for a week or so perhaps we ran upon one mixture and then changed over and tried another. Of some of the ores, as you will notice, only very small quantities were used. I cannot give the percentage of iron in all of these ores; but here are averages of a few of them:—Imperial, 57.8 per cent of iron; Lake Superior No. 1, 65.2 per cent.; Cleveland Lake, 61.5 per cent.; Cleveland Scotch, 62.6 per cent.; Michigamme, 65.5 per cent. The total make of iron during the run was 9,361 tons. I have not got the exact figures as to the cost per ton of the iron ore laid down at the furnace, but the quantity of ore required to make a ton of iron cost us $6.55, the ore yielding an average of 57.8 per cent. of iron. When I speak of the ton of ore I mean the net or short ton of 2,000 lb., in which way be bought all our ore, but the iron was sold by the long ton of 2,260 lb. I give the product in long tons, but the ore in short tons. In Texas we allow 2,268 lb. to the long ton.

Quality and cost of ore smelted.

Mills.

"We manufactured our own supply of charcoal to a large extent. We made it at two different sets of kilns, and also bought some from outside parties. One set of kilns was twelve miles from the furnace, and the other was between twenty-four and twenty-five miles up the railway. We used beech, maple, birch and a little elm in making charcoal, as little elm as possible. It was all hardwood except a little soft maple. The timber was good and heavy. We could cut from 40 to 45 cords of wood from an acre. We cut up the whole tree, everything down to three inches thick. A cord of wood would make about 45 bushels of charcoal in the kilns. We did not make it in any other way; we did not use any pit coal. I cannot tell you what the charcoal weighed per bushel; we called 20 lb. a bushel and settled for it and paid our colliers, etc., on this basis. At one time we kept accurate account of the coaling and handling of 2,000 cords of wood, and the resulting charcoal cost us 4¼ cents per bushel f. o. b. cars at the kilns. The freight to the furnace was three-quarters of a cent per bushel. During the campaign I mentioned we used 870,000 bushels of charcoal. The cost of the coal per ton of pig iron was $6.89. At the second set of kilns, which was not so well managed, the coal cost us more, and the coal we bought from outside parties cost us very much more than it ought to have done.

Production of charcoal fuel.

Flux.

"With regard to flux, we were most fortunately situated. During the last run I decided to extend the stock-house, which was not large enough to carry a proper supply of ore for the winter. On commencing our excavations I found that the upper end of the stock-house was built on limestone, and we excavated the limestone for flux and extended the stock-house at the same time. Before this we had quarried the stone about a quarter of a mile from the furnace. The quantity of limestone we used for flux varied according to the nature of the ore. We used a very small proportion, as our ores were low in silica and were to some extent self fluxing. The Webster, Imperial and some of the other ores carried a good deal of lime, so that our proportion of limestone ranged from 40 to 70 lb. per charge, averaging perhaps 60 lb. An average charge consisted of 1,800 lb. of ore; with that we would use 50 or 60 lb. of limestone, which is a very low proportion. We did not put an estimate on the cost of the limestone, as under the circumstances it really cost us nothing; we were obliged to excavate it in order to extend our stock-house.

Cost of labor.

"As to the furnace itself, a correct description of it, giving the dimensions, etc., was published in the Charcoal Iron-Workers' Journal. The machinery, blowers, etc., were also described in that article. We had 26 men employed about the furnace; then there were the engineers and others; in all there must have been 38 men. The cost of labor per ton of iron was $1.42, which includes superintendence, fuel for switch locomotive and blacksmith's wages.

Total cost of production.

"The facts which I have given regarding the campaign referred to will apply to the general run of our work. We have done better, and we have done worse. At the prices which we were paying for the ore, labor, etc., the total cost of production of iron per ton was $15.70. According to the books in the office the cost was $15.94; but there were some charges which ought not properly to have been entered against it. The pig iron was used exclusively in the manufacture of car wheels, and very largely by our own people. The furnace was built for the express purpose of supplying the Erie Car Works, the property of Davenport, Fairbairn & Co., at Erie, Pennsylvania.

Experience in Texas.

"I was nine years in Michigan altogether, leaving there early last year and going to Texas. I did not build the furnace at Texas; it had run for about six weeks and then shut down before I took charge. It is supposed to have a capacity of 50 tons, and I hope we shall make it a 50-ton furnace, but owing to defects in construction it did not run over 40 to 45 tons. It is larger than the Martel furnace; it is 60 feet high by 11 feet bosh, and 6 feet

6 inches crucible. There are six tuyeres; the Martel furnace had five. We use the warm blast in Texas, from 500° to 900°. At the Martel furnace we used from 1,100° up as high as 1,800°; I have run as high as 1,800°. We use the gas from the furnace in heating our boilers and heating stoves. The furnace is located at New Birmingham, Cherokee county, Texas. Mills.

"The ore used at the furnace occurs in what is known as a blanket deposit. It is found on the tops of hills, at an elevation of about 700 feet above the Gulf of Mexico, throughout the counties of Angelina, Rusk, Cherokee, Smith, Henderson, Anderson and several others. The level is so invariable that you can almost tell the elevation at which you are above the gulf by finding this ore. It is a brown hematite, somewhat similar to the bog ores of Quebec. It is a bog ore formation and is found near the surface, the earth being removed by means of ploughs and scrapers. The ore is then broken up with bars and picks, very little powder being used, and after stripping a bank of ore the earth from the next strip is thrown into the excavated place, so minimizing the cost of excavation. The beds range in thickness from 18 inches to 3 feet 6 inches. It is covered with sand, and generally underlaid by sand also; it is not found in vegetable mould. The thickness of the overlying sand varies from nothing to 12 feet, but we do not touch the deeper portions. If the bed is covered with more than six feet of sand we leave it. The ore analyzes 45 per cent. iron, and will yield in the furnace somewhere about the same. There has been an amount of irregularity in the output of the furnace that shows an irregularity in the ore itself. It has appeared to run from 45 to nearly 50 per cent. in the furnace. It must be more than that in the ore, but pig iron is not all iron by a good deal. The softer grades particularly run down as low as 96½ per cent. of iron, the balance being silica and carbon. There is a large amount of graphitic carbon, as much as two or three per cent., in the softer irons. There is some sulphur and phosphorus in the ore. I have not the analysis here with me, but it sometimes runs as high as 0.2 per cent. of phosphorus. There is a little sulphur; some analyses I made myself ran from a trace to .06; it varied considerably. We lay down the ore in the stock-house at a cost of 65 cents a ton. Our labor is not so very cheap; it costs us from $1 25 to $1.50 per day. It is negro labor chiefly, and we find it efficient. With a gang of forty or fifty negroes we have two to four white men as drillers; and in case we use a little powder we employ the white men to drill. We pay our foreman miner $2.50 per day. Bog ore.

"Our company makes its own charcoal. Up to the present time we have been making it in pits exclusively; but the intention of the company is to raise some more capital and go into larger development, probably building another furnace, and more kilns for making the charcoal. There are two kilns already built, which I put up last year. The supply of wood for charcoal varies in distance from the furnace. Our kilns will be located at the furnace, but that will have nothing to do with the point of supply of the wood, which will be brought to the kilns by rail. Our charcoal has been costing us somewhere about seven cents per bushel; we expect to cut the price down considerably. Charcoal.

"We ran our last campaign about eight months, and then decided to shut down for alterations and repairs. There were a great many repairs found necessary, and a great many alterations were required in the stock house and in other ways. We are subject to very heavy rains there, and the upper works of the furnace were leaking so that the rain got into the furnace. The low price of iron had a good deal to do with our shutting down; it was the principal reason. Iron went down to such a price that it would only net us $12 per ton, and it was costing us $11.75 to $11.90 to produce it.

Mills.

Iron ores of the Kingston district.

"Coming back to Ontario, I cannot say that I have any other knowledge of the iron deposits of this Province than I gained during my explorations in the neighborhood of Kingston. From what I then learned I formed the opinion that there were large bodies of iron ore in the Frontenac country and its vicinity. I felt certain that there was a large amount of iron there. It was of good quality, not to be surpassed anywhere. It was chiefly magnetic. There were some indications of hematite, but hematite ores are not to be discovered by the use of the dip needles; nothing but actual work will show their presence unless they crop out. The only way to find them is by using the diamond drill. I have seen indications of outcroppings. Where discoveries are made in Michigan and Wisconsin of hematite ores the diamond drill is used very largely in prospecting for them. There will always be more or less indication on the surface in the case of hematite ores from the discoloration, but I have heard of borings being made without any surface indication. Brown hematite is always found by the discoloration. It is almost always at the surface, and you will find a very frequent indication to be the deposits from the water. If you find a spring of water leaving a deposit of brown ore you may be perfectly certain that there is a body of it somewhere in the neighborhood. I certainly recommend the use of the diamond drill in prospecting for red ores, and for magnetic ores as well. In the case of magnetic ores we do a good deal with the dip needle, but as a confirmatory test I consider the diamond drill is necessary.

Prospecting with the diamond drill.

Treatment of magnetic ores.

"In furnace work it is found to be very desirable to use a mixture of hard and soft ores; but hard magnetic ores may be greatly improved for furnace treatment by roasting. By adopting the following plan such ores can be used for smelting without mixture: take a portion of magnetic ore and use it in its raw condition, and roast the rest of it. In New Jersey this plan is followed. The object of the roasting is to change the nature of the ore and convert it from the protoxide to the sesquioxide, thus virtually changing it into a hematite ore. The advantage of the hematite is that it is an open ore, more open than the magnetic, the consequence being that in the furnace it takes up carbon more readily and parts with its oxygen more rapidly. The reaction is much more rapid with hematite ore than with magnetic; the reason being that in the first place the latter ore is dense throughout, and in the second it has a smooth polished surface, consequently it resists the action until it goes down a certain distance in the furnace. Long before the hematite ore has reached that level in the furnace it is to a great extent reduced and thoroughly saturated with carbon The practice of roasting magnetic ore and using ore thus treated with raw magnetic ore in the furnace is followed at Boonton in New Jersey; when I was there some years ago I found them running entirely upon that plan. The Oxford furnace, situated at a town in New Jersey whose name I do not now recall, has carried on the same practice. At Boonton they roasted the magnetic ore in heaps. They took cordwood and laid it in rows lengthwise about three fee apart, covering a width of about 30 feet; they then bridged this over with a regular layer of cordwood laid close together, and on this the ore was piled and ranked back with the sides sloping at an angle of 45 degrees. In firing, in addition to the wood they occasionally put a little coke dust along with the ore, but the ore carried a good deal of sulphur, and the sulphur assisted in the roasting. The presence of sulphur in the ore was certainly part of the reason why it was roasted, but they would have had to follow this plan in any case because they could not run on magnetic ore alone. The furnace would run irregularly and give no end of trouble; besides, a proper quality of iron could not be made in this way. By roasting part of the ore they were able to make the quality of iron they required. They used coke for smelting. They made ordinary merchant bar; they had also a rolling mill and puddling furnace, and I think put the whole product of the furnace into merchant bar.

"From what I know of this country I would advise the making of both charcoal and coke iron. You have an ample supply of charcoal available in the country. I think you could manufacture charcoal iron to greater advantage than coke here, because in the latter case you would have to import your fuel. The trouble is there is often difficulty with stove manufacturers and others in using charcoal iron, owing to its tendency to chill. They prefer coke iron for ordinary purposes, for the manufacture of water pipe and things of that kind. At the same time for heavy castings there is no objection whatever to the use of charcoal iron; on the contrary, it is an advantage because it is a better iron. It makes a stronger and better finished plate than coke iron, but when you come to make thin castings like stove plate there is a little difficulty; there is some danger of getting a chilled casting, and there is a difference in the grinding, etc. Mixing a small quantity of charcoal iron with coke iron gives a tougher plate, but to make it exclusively of charcoal iron does not answer so well. If you want to make good malleable iron castings however you must have charcoal iron.

Mills.

Charcoal and coke irons are needed in Ontario.

"I think charcoal iron can be made more cheaply here than in Michigan, because you can get your ore cheaper here. I am convinced of that. You can get it in sufficient quantity, and I believe it will cost you a dollar a ton less for ore than in Michigan. I figured on getting ore here at such a price when looking into the question here a few years ago, and my calculations were based on information I received from Mr. T. D. Ledyard, from my own knowledge of the cost of ore at the mines north of Kingston, and from information I got from other parties with whom I went thoroughly into the matter. I came to the conclusion that the ore for the manufacture of iron here would not cost us more than about $4 per ton, which is over $2 a ton better than in Michigan. When I say $4 a ton I mean $4 for the ore required to make a ton of pig iron.

Cost of ore in Ontario as compared with Michigan.

"The roasting of the ore at Boonton costs 25 cents per ton. It may cost a little more, but I understand it has been done for that in other places. The cost depends entirely upon the facilities you have for obtaining roasting material; where you have charcoal braize collecting about the furnace it is a very easy method of getting rid of it. On roasting a large quantity of ore in Texas we found the process cost us 25 cents per ton, and it improved the ore some. We used charcoal braize, and had to haul it a mile and a quarter. We found it paid to roast the ore at the mines better than to haul the ore to the furnace and roast it there, as we had no facilities for roasting it at the furnace. When the miners were mining the ore they would load it right into the carts and the carts delivered it on top of the kiln where it was roasted, thus saving one handling. When the waggons came from the mine with the ore they took charcoal braize back, and so this plan we found to be the most economical.

Cost of roasting ore.

"The fact must be taken into consideration that charcoal iron made here would come directly into competition with coke iron. Users of iron would prefer it if they could get it at the same price, and possibly they might pay a little more for it for some other purposes, but when I was investigating some years ago I found that the malleable iron makers of Canada were using coke iron, although supposed to be using charcoal iron. Some of their employés admitted to me the fact that they could not make malleable castings equal to the United States castings for the simple reason that charcoal iron was used in the United States and coke iron here. I consider that charcoal iron could be made here more cheaply than at the Martel furnace, or in Wisconsin, but supplies of coke iron from Great Britain would doubtless come into competition with our charcoal iron.

Competition of charcoal and coke irons.

"With regard to the cost of producing coke iron here, I made some calculations three years ago, which might perhaps have to be modified a little now; but as near as my recollection serves me, the estimate I arrived at

Cost of producing coke iron.

Mills.

was $14.50 per ton, assuming we could get coke in duty free. Coke would cost us more here than at any point in the United States equally distant from the source of production, for the reason that we would not have return cargoes, unless we could get out our iron ore so cheaply as to be able to compete with the American ore and carry the duty as well. I am not favorably impressed with Nova Scotia coke. From what I have heard of it I believe it contains a large proportion of ash, running all the way from 8 to 20 per cent. I do not think it contains much sulphur. Pittsburgh coke contains from about 5 to 8 per cent. The worst Pittsburgh coke is about on a par with the best Nova Scotia, so far as I can learn. I do not think the Nova Scotia coke contains a higher percentage of sulphur than the Pittsburgh coke; I do not fancy that it does. But the cost of freight on Nova Scotia coke would be enormous. The magnetic iron mines north of Kingston are very much nearer to Pittsburgh than the lake Superior mines. The question whether you could send return cargoes of ore would depend largely upon the price which the mine owners would set upon the ore. If they were satisfied with a reasonable profit I see no reason why a trade could not be done. If they were exorbitant in their demands, it could not be done. I assume that a much larger quantity of iron ore would be raised if we could smelt it. If a start were once made I believe the business would develop, and that a much larger amount of ore would be mined than we could use ourselves. In that way we might be able to afford return cargoes to Pittsburgh and establish a regular trade back and forth. If once a mine was opened and thoroughly worked, it would pay to ship ore to the States in face of the duty.

Nova Scotia and Pittsburgh cokes.

"In the attempt to establish an iron industry here with a protection of $4 a ton on pig iron and a bonus of $2 per ton, the competition of British iron makers would have to be met. You would probably make at first a quality of iron only equal to a low grade of English iron. We have not the selection of ores they have; we may have better ore, but we have first of all to learn how to use our ores in order to produce the best quality of iron. It would not be safe to go upon any other ground than to count upon making at first an iron equal to the lowest grade of English iron, which at present commands a price of about $16.25 per ton here, duty paid. The cost at which I estimated we could make iron here was $14.50 per ton, which leaves us only $1.75 and the $2 a ton bonus, equal to $3 75 a ton altogether. Against this we must set the probability of the English furnace-masters putting the price of their iron down to somewhere about $13 per ton, which they can do. They would, I believe, make a push to meet the competition of iron made here, and they would even sell their iron at a loss at the start with a view of crushing the industry out. In order to make the undertaking a success we ought to have about $2 a ton more duty, and the duty on scrap iron ought to be made the same as upon pig iron. The present duty on scrap iron is only $2 per ton.

Protection against British iron makers.

"Another point is this: if we want to establish a large iron industry, something like the Pittsburgh industry, as we certainly can do if we set the right way about it, we must get a chance to make steel rails, which are now admitted free of duty. I would advise putting a duty of $6 a ton upon iron. I think it is $12 a ton in the States. But the removing of steel rails from the free list and the placing of the same duty on scrap iron as on pig are the most important things. It might be we could get along if we were saved from competition with scrap, which coming in at a duty of $2 a ton supplies a large proportion of the demand. I was talking to Mr. James Worthington of the Bolt and Nut Works a few days ago, and he said there was a large amount of scrap coming into the country. I would propose to put the duty on scrap iron up to the duty on pig, or near that figure. I think we ought certainly to manufacture all our own iron. If rolling

The trade in steel rails.

Low duty on scrap iron.

mills for the manufacture of round and square iron and iron of various kinds, as well as steel rails, were established, one would help another, provided the duties were equalized; if for instance the duty on merchant iron were not so low as to partly counteract the duty on pig. Of course if the English manufacturers found themselves unable to send their pig iron they would send their bar if they could get it in cheaper than pig, and the result would be to hamper us again. It would be necessary to make sure that we had sufficient protection against that as well. Mills.

"There is another serious difficulty in connection with the proposal to establish an iron industry here, and I do not know how it is to be met. It is the feeling that exists amongst capitalists, both here and on the other side, that even if a sufficient duty were placed upon iron it would be liable at any time upon a change of Government to be removed or reduced, in accordance with the politics of the incoming party, and that capital invested in the iron industry would consequently not be safe. The question arises, What guarantee can be given to capital that such changes will not take place? Of course if the industry had once taken firm root in the country, so that a large proportion of the population were directly or indirectly interested in the maintenance of the works, the question would settle itself, but until a sufficient proportion of the people to make themselves felt in politics become interested in the maintenance of the industry, this difficulty will stand in the way. I have this very statement made to me by capitalists in the United States when speaking to them on the subject, not only in connection with iron, but as regards timber limits as well. Some years ago I was trying to sell some timber limits for a friend on the other side, amongst others to some Bay City and Saginaw men, but they would not touch them. They said 'We do not know the minute your Government will put an export duty on timber.' In the United States the Democratic party certainly favors a revenue tariff, but the iron industry is of such enormous magnitude that I believe if the Democratic party were to take the ground squarely and say 'We are going to admit iron free,' it would simply put them on the shelf forever. They would have no chance at all. I am aware that at the last election the Democratic party adopted the plank of tariff reform, not specifying particularly a reduction of the iron duties, though these duties were widely discussed, and it was pointed out by Wells and others that they were a heavy tax on the producing classes of the United States. There is no doubt that the iron duties in the United States are too high, unnecessarily high. I think the position taken by the Democratic party affected the investment of capital to some extent, but the fact is I have been too much engaged in actual business to pay very much attention to politics. It is perhaps a curious conclusion to come to, but my impression is that the iron business in the United States would probably be in a more healthy state were it not for the high duties. So far as this country is concerned, the great bug bear, the sticking point, seems to be the fear entertained by capitalists that a protective tariff might not prove a permanent one. The uncertainty of protective tariffs.

"There was an observation made to me the other day to the effect that the capitalists who had money invested in the industries of this country and who were developing its resources were chiefly Conservative in their politics, and that on the other hand the capitalists of the Liberal party had carefully abstained from putting their money into manufactures of any kind, but had invested it in mortgage and loan companies, in real estate, in shares of gas companies and in railway stocks and things of that kind. An observation of that kind shows what the impression is. I am not in a position to judge whether or not the statement is true, but the gentleman who spoke to me had every opportunity of being well posted."

SAMUEL J. RITCHIE'S STATEMENT.

Ritchie.

"I am interested in iron lands along the line of the Central Ontario Railway and in all the copper and nickel lands belonging to the Canadian Copper Company, as well as in the lands belonging to the Anglo-American Iron Company and those formerly belonging to the Vermilion Company. I think there are a little over 70,000 acres of iron lands held by our Company in Hastings county; I am not sure of the exact acreage. This does not include the Coe Hill mine, in which I am not interested. The Central Ontario Railway was built for the purpose of developing this property. The first thing we did was to make a contract with Mr. Coe when we purchased the lands now represented by the Coe Hill Mining Company, 14,000 or 15,000 acres additional, to build a railroad up to those lands and develop them. The railway was built from Trenton northward wholly and solely to operate and develop the iron interests there. We constructed ore docks at Weller's bay, and so far as transportation went we had all the facilities for developing and carrying the ore. We carried on operations at Coe Hill for two or three years, and got out eighty or a hundred thousand tons of ore; I do not now recollect the exact quantity The ore went principally to Cleveland, where it was remelted by the Cleveland Rolling Company. The results were satisfactory until the ore began to develop sulphur. There was very much less sulphur in the ore at the surface than farther down, so that not much was thought about it for the first cargo or two. The ore was rich in iron, carrying about 65 or 66 per cent. This mining was done in 1883 and 1884. We discontinued operations because of the sulphur, which rendered the ore unsaleable. There is a large quantity of ore lying there now. An attempt was made to roast it in the form in which it was mined, in coarse lumps, and the result was that only for half an inch from the surface was the sulphur driven off. The ore was not very dense. At that time the practice of breaking ore for the roast heaps was not adopted to any extent in the United States. There were furnaces where the ore was roasted, among others the furnace known as the Taylor & Langdon, but they were only adapted to treat the ore in a small and rather expensive way. From my explorations I am satisfied that there is any quantity of iron ore of this grade—containing more or less sulphur—in the district I am speaking of. I had Mr. Bolger make a survey for the railway, and in his report he states that for a distance of seventeen miles on a portion of the line immediately north of Coe Hill the compass was utterly useless; iron seemed to be present in mass all through the country. There is no doubt about the extent and quantity of that class of ore, such as could not be utilized then, but is now valuable when treated by the concentrating process. I did not find any red or brown hematite ore there.

Central Ontario Railway built to develop iron ore properties in Hastings.

Ore of the Coe Hill mine rich in iron, but high in sulphur.

Processes for cleaning and concentrating ores containing sulphur and phosphorus.

As to the concentration process, a machine has been patented by Lovett & Finney of Chicago which I have seen in operation at various places, and which I believe to be a great success. I have watched the machine in practical operation at a place in New Jersey where it is operated by the firm of Hecksher & Sons of Philadelphia. They were running it there on a very lean ore; magnetic of course, as it is no use for any other kind. It is a magnetic separator, and in my opinion is adapted to treat the Coe Hill ore. Washing the ore is an additional process after treatment in the magnetic separator. This machine combines the two processes; you can of course run it without the water, but the ore is much improved by adding the water, because it takes out nearly all the phosphorus. This machine reduces the ore to a fineness of about 10 or 15 mesh. I had a large model of it constructed and brought to Trenton, and had about half a ton of ore crushed to about 15 mesh size, and put through several hundred pounds in the presence

of about a thousand people during the ten or twelve days we were there. A machine running with a 48 or 50 inch belt will run through five or six tons of hard ore an hour. It gives an ore practically free from phosphorus. Of course where sulphur is in chemical combination with the iron the machine will not take it all out, but the experiments I have made show that we can drive that sulphur off with a low degree of heat in about half an hour afterwards. The ore varies with respect to the way in which the sulphur is combined with the iron. Sometimes it is found in chemical combination and sometimes in mechanical combination; it is not a serious matter whichever way it is. At one of the mines on the Hudson river they have been able to desulphurize the ore at a cost of from 9 to 13 cents per ton after the mechanical process has been gone through with, leaving it free from these impurities at a cost of 20 cents per ton. The whole process, concentrating and desulphurizing, might cost 40 or 50, or perhaps 60 cents for a ton of concentrates. That would give an ore free from sulphur and phosphorus and containing about 68 or 70 per cent. of metallic iron, and would enable us to use the entire product of a mine instead of only half or two-thirds of it as you now do, and thus make a great saving in the cost of mining. Edison is treating ore successfully containing only 18 per cent. of metallic iron. There is also a saving in freight charges when transported; the freight rates are lower, as it does not injure a boat or a car any more than a load of wheat. Furnacemen used to say that a charge of this concentrated ore would choke a furnace, but they have got over that nonsense now. The Bethlehem Iron Company are producing the finest steel in the world, and they tell me that they can use 50, 60, or even 75 per cent of the fine ore. They make an offer to buy all they can get. I have a correspondence with them which reads as follows: A. Ritchie.

'Bethlehem, Pa., October 17th, 1891.

'Mr. R. P. Linderman, President of the Bethlehem Iron Company, South Bethlehem, Pa:

'Dear Sir,—I am interested in a large amount of iron ore along the line of the Central Ontario Railway in the Province of Ontario. Your Company has also made quite a large investment immediately upon the line of this railway. The larger portion of the ores in which I am interested are not marketable in the form in which they are mined from the ground, owing either to the fact that they contain too much sulphur, or that they are too low in metallic iron. For these reasons the mines have not been worked for the last four years. I have thought that the new method of concentration and separation by the magnetic process would afford a solution of these difficulties, but it is urged upon me that fine concentrates cannot be successfully used in the furnace, and that there is therefore no market for this kind of ore. I would therefore be greatly obliged to you if you would give me your experience in answer to the following questions: Concentrated ore smelted at South Bethlehem.

'1st. Have you been using, or are you now using, fine concentrated ore in your furnaces? If so, are the results obtained from it as good and favorable as those obtained from coarse or lump ore?

'2nd. What percentage of the whole charge in the furnace of this fine ore do you use, and how high a percentage do you think you can successfully use?

'3rd. Do you manufacture any pig iron from ores which contain any considerable percentage of sulphur? If not, do you purchase pig iron from parties who do make it from ores which contain sulphur? If so, who are the parties who make pig iron from sulphurous ores? How much sulphur do the ores contain as mined from the ground, and which are afterwards smelted into the pig iron purchased by you?

Ritchie.

'4th. Does the pig iron made from these sulphurous ores contain any sulphur, and can it be used in the manufacture of Bessemer steel, and is it so used by any considerable number of Bessemer steel manufacturers?

'5th. Would you be willing to purchase any large quantity of fine concentrated ore? Very truly yours,

(Signed) S. J. RITCHIE.'

'THE BETHLEHEM IRON COMPANY,
'SOUTH BETHLEHEM, PA., Oct. 17th, 1891.

'Mr. S. J. RITCHIE, Akron, Ohio:

'DEAR SIR,—Answering your letter of the 17th inst, I beg to reply to the several questions that you ask me as follows:

Percentage of concentrated ore smelted in the Bethlehem furnaces.

'1st. We have used and are using a certain percentage of fine concentrated ore in our blast furnaces; the results, so far as I am aware, are as good as those obtained from coarse or lump ore.

'2nd. The highest percentage of concentrated ore which we have so far used in our charge is about 50 per cent., but I see no reason why a higher percentage might not be successfully used. If the ore is low enough in phosphorus, so that it need not be reduced too fine to eliminate that element, I see no reason why we should not use as high as 75 per cent., or possibly more

'3rd. We do not manufacture any pig iron from ores which contain any considerable percentage of sulphur; we do however purchase pig iron from parties who do use ores which I understand contain in their natural state quite a high percentage of sulphur—the ore referred to is the Cornwall ore. I cannot say how much sulphur these ores contain as mined from the ground, but have no doubt that the parties who use this ore would willingly give you this information.

'4th. The pig iron made from Cornwall ore contains some sulphur, but not sufficient to prevent its being successfully used in the manufacture of Bessemer steel, and it is so used by the large steel rail mills in the east.

'5th. Whether we would be willing to purchase any large quantity of fine concentrated ore would depend almost entirely upon the price and quality.

'Trusting that the above will satisfactorily answer your questions, and holding myself ready to give you any further information that I can, I am, Yours truly,

'(Signed) ROBERT P. LINDERMAN, President.'

'I have also a letter from Thomas Edison on the same subject, of which the following is a copy:

'ORANGE, N. J., November 26th, 1889.

'S. J. RITCHIE, Esq., New York City.

Edison's magnetic separator.

'DEAR SIR,—Replying to your letter of 21st instant, in regard to refining ores in Canada by means of my Magnetic Ore Separator, I beg to answer your queries categorically as follows:

'1st. What would be the approximate cost per ton of the ore as mined from the ground, for crushing and separating the iron contained in it from the silica or other foreign matter, by your process? A. Actual cost, 62 cents per crude ton.

'2nd. How much iron will you be compelled to waste in the rocky matter which you separate from the iron? A. 1½ to 2 units of original ore.

'3rd. How high a grade of ore can you produce from an ore carrying, as mined, say forty per cent. of metallic iron? A. Average 65 per cent; by refining concentrates, cost ten cents per ton, 68 per cent.

'4th. What would be the difference per ton in cost of producing an ore that would yield sixty per cent. and one yielding sixty-eight per cent.? A. Ten cents. Ritchie

'5th. To how low grade of ore can you use the whole product of the mine, without throwing any portion of it into the waste heap, by sorting or separating it into second-class piles? A. It will pay to use as low as 20 unit ore.

'6th. Allowing, as is usually the case in all magnetic ores, that thirty per cent. of the ore mined is thrown into the waste heap, these heaps usually carrying about forty per cent of iron, how much of the cost per ton for mining can you save by grinding up the whole amount mined and saving all the ore contained in it? A. Ordinarily, mining costs $1 per ton; if you take everything down to twenty unit, cost generally will be 50 to 60 cents.

'7th. Can you lower the phosphorus contained in magnetic ores? A. We can reduce the phosphorus 75 to 80 per cent.

'8th. Will the fine ore which is obtained by your crushing and separating process be worth as much per unit of iron when delivered at the furnaces as the lake Superior Bessemer ores containing an equally high percentage of iron? A. Yes, so the iron men say, and worth more if we go to 68 per cent.

'9th. Calling the mining of the Canadian magnetic ores one dollar per ton, the railway and lake freight one dollar and sixty cents per ton, the duty seventy-five cents per ton, seventy-five per cent. of the ores carrying fifty-five per cent., and thirty per cent. carrying forty per cent: can you deliver this ore in Cleveland at as low a price per unit of iron as the lake Superior ores can be delivered at same place, the lake Superior ores being subject to a royalty of fifty cents per ton and the Canadian ores being free from royalty? A. About the same. Can on above assumption of costs deliver a 68 per cent. ore at Cleveland for $5 per ton, sure, against a 65 per cent. ore from lake Superior. Cost of treating ores by magnetic concentrator.

'10th. On what terms will you erect, at your own expense, upon the line of the Central Ontario Railway at the mines belonging to the Anglo-American Iron Company in Canada, the plant for which you have now completed the plans, having a capacity for treating one thousand tons of ore per day? A. I will put up mill and refine for 70 cents per crude ton to 65 per cent., and refine concentrates at ten cents per ton, to bring it up to 68 per cent.; capacity 1,000 tons daily, no less. You may purchase mill at end of two years on twenty per cent. earnings being capitalized at par.

'11th. On what terms will you put up a similar plant having a capacity of 2,000 tons per day? A. Sixty-seven cents.

'12th. How soon can you have this plant in condition to work? A. Beginning May 1st, 1890, 90 working days.

'13th. Do you think it practicable and advisable to put up a blast furnace for smelting this ore, and a steel plant for the manufacture of steel, in Canada? If so, what measures are necessary to be adopted by the Dominion Government? A. Yes; protective tariff and a bonus for eight years.

'14th. Are you willing to become interested in the smelting and manufacturing of iron and steel in Canada? A. Yes. Very truly yours,

'(Signed) THOMAS A. EDISON.'

"I have a similar letter from the parties who treat the Hudson river ores, offering to either put up or run a plant with a daily capacity of 2,000 tons, and to reduce the sulphur down to two-tenths of one per cent. I have had further correspondence with Edison, and he offers to put in a plant capable of treating 2,000 tons per day. His process does not differ very materially from the one I have been speaking of. He uses a different kind of crusher: that is about the extent of the difference. I do not think they can use the entire charge of the furnace of this fine ore; I think they would have to use some coarse ore with it.

Ritchie.

"Unquestionably a good grade of iron can be made from the magnetic ore only. The best Norway iron is made wholly from it. It is not at all necessary to mix the magnetic ore with red hematite to secure the best results.

Magnetic ore in furnace practice.

"I want to say that if I had not been hindered by my own associates I could have had a plant erected at Trenton, at which the ore from along the line of the Central Ontario Railway would have been treated and mixed with the nickel from Sudbury, and Canada would today be supplying the Bethlehem Company with the nickel and iron to make the plates used on the American war-ships. I have no doubt at all that iron furnaces could be successfully established in this Province. The fuel for them to use would be coke; the distance is shorter from the place on the Rochester and Pittsburgh Railroad where coke is made than it is to Joliette, Illinois, by a hundred miles. I think this material could be taken into the United States free under the McKinley tariff, which levies the duty on the article of chief value. Suppose you make something in the way of matte and send it in the form of pig iron, I think it would go in free under the McKinley Act. Say the pig iron were worth $10 and the nickel $16, the whole would go in free, because nickel is free. This was the intention when framing that provision in the tariff law.

Possibility of making coke iron in Ontario, in combination with nickel.

"I think the iron industry can be most successfully established in this country in combination with the nickel industry. I do not see how it could live here alone. There would be no use in anyone trying to send iron from here to any other country, whereas nickel steel could be sent to England or the continent, or anywhere in the world. There is no question that the demand for nickel steel will be a large and permanent one. I can quote what Sir James Kitson told me the last time I saw him; he said that every boiler in Her Majesty's war vessels would be superseded by nickel steel boilers, and that every plate upon Her Majesty's ships would be superseded by nickel steel plates, and this not only for first class, but even for second and third class vessels Sir James is ex-president of the Iron and Steel Institute. There is no doubt that nickel steel must be preferred for any purpose where great strength, elasticity and resistance are required. There is a market in the United States for this ore when treated in the way I have described, and the difference between the freight you would have to pay, for instance, from anywhere on the Central Ontario to points east of the Allegheny mountains and the freight you would have to pay from lake Superior ought to more than offset the duty. Canada ought to have a large market of her own. She has upwards of 13,000 miles of railway—a larger percentage of mileage per head than the United States—and there is no reason why she should not produce the highest grade of material for all her locomotives, cars and car-wheels which she now buys of Krupp. Krupp has got to go to Africa for his ore and ship and haul it by rail. If he gets any nickel he must go to New Caledonia or Canada for it. There is no reason why all these things should not be manufactured here. There is no such difference in labor, fuel or tariff as to prevent it. I am certainly of opinion, from observation in my own country of such towns as Pittsburgh, Chicago, Cleveland, Reading and Bethlehem, that by the establishing of various branches of the iron industry you create a local market for pig iron, and in that way you put the industry on a better basis. I do not know any country that ever got rich by selling raw material and buying manufactured, and I do not think that Canada will prove an exception. She needs to manufacture for herself; she cannot sell grain from the farm and buy manufactured articles, paying 30 or 40 per cent. duty on them, and prosper very well

Demand for nickel steel.

Local market for the product.

"There is no reason in the world why the iron industry should not be established in Ontario. The Illinois manufacturers haul their coke over five hundred miles; you do not need to haul yours over three hundred. These companies do not have any return cargoes; the cars in which the coke is brought go back empty. No grain or anything of that kind is shipped in

The coke supply no hindrance.

them. The cars are owned by the companies themselves. Train after train comes to the Illinois Steel Company with coke, and goes back empty. The copper mines at Butte, Montana, get their coke from Connellsville, and pay $18 or $19 a ton for it. I have not the figures with me which would enable me to say what amount of freight the establishment of such an industry would contribute to the railways, but I can say this that if the mineral business were taken away from the Pennsylvania system of railroads it would bankrupt it in four months, and the case is similar with all the railroads in the United States. The only wonder is how the roads here can live without such a business at all. Ritchie.

"The iron business would afford employment for all classes of labor, from the most skilled artisan to the common navvy. A great number of the iron workers in the States are paid high wages, higher than any form of labor employed in Canada. Labor in the iron and steel mills and iron furnaces of the United States is better paid than labor in the mines or on the farm—more than twice as much as farm labor. Employment of labor.

"For the manufacture of nickel steel it does not matter much whether you have protection or not. Steel rails I think now come into Canada free. You have no industry to protect, if protection pure and simple is what is aimed at. What you want to do here is to produce an article which you can not only sell at home, but export it abroad and keep your balance of trade right. If you make nickel steel you do not need to swap it for anything. You could not sell iron alone in England; carrying coals to Newcastle would be an easy task compared with that. I do not know how they could manufacture nickel steel more cheaply in England than we could here. They cannot manufacture for nothing there any more than we can here. Their coke costs as much as your coke would cost. When I was over there last, coke was higher a good deal than it was in the United States. I think that there is little doubt you could lay down coke here just as cheap as the majority of manufacturers in England get it. I do not think there is anything lacking now to enable the industry to be established, since a process has been invented to treat such ores as you have here. If you were going in, depending wholly upon the ore as it is taken from the ground, it would be another story. There is plenty of ore where there is no railway. Between the end of our railway and the Northern there are large deposits of ore containing no sulphur. But as you are able to treat the entire output of the mine by this process and get a superior class of ore, especially after roasting it, it is not so essential that a first class ore be provided by nature as it used to be. No protection needed to establish a nickel steel industry.

"I think if your moneyed men who have invested so largely in loan societies, etc., wish to protect their investments they cannot do better than set about establishing this industry. No country can ignore such a natural storehouse of wealth and expect to prosper. Compare the Southern States of today with what they were before the war, when they used to purchase everything with cotton, even the bacon they used, from the north, and see what a change has been brought about by the development of their mineral resources. Lands around Birmingham that were offered to me for fifty cents or $1 per acre could not be bought now for $5,000 or $10,000 per acre." Why capitalists are interested in establishing the industry.

CHARLES J. PUSEY'S STATEMENT.

"The facilities which the Haliburton and North Hastings district affords in the abundance and variety of ores, the accessibility of limestone for flux, and the large quantities of good hardwood for charcoal, would in my opinion enable the manufacture of pig iron to be carried on there to greater advantage than at any other point. The advantage of making charcoal iron over coke or anthracite iron is that it circulates every dollar which enters into its manufacture among the people of the country, while in the case of coke or Pusey.

Pusey.

anthracite iron about one-third of the entire cost is sent out of the country for fuel. I think that is an important point. We have estimates made by Mr. Witherow of Pittsburgh, now dead, of the cost of making charcoal pig iron at Snowdon. Taking the cost of mining the ore, the cost of wood and the expense of making it into charcoal, Mr. Witherow estimated the cost of manufacturing charcoal pig iron there at about $10 per ton. On the basis of the data I gave him he said he would undertake to make it at that figure. I gave him the market value of the cordwood delivered at the railway, the cost of other supplies, the analyses of the ores and all other data he required in making his estimate. It was a little less than $10 per ton. The exact figures as given by me in the report of the Commission on the Mineral Resources of Ontario were $9.08 per ton, and I see no reason for changing them."

Advantage of making charcoal iron over coke or anthracite iron.

Cost of production.

JAMES CONMEE'S STATEMENT.

Conmee.

"There does not appear to be any prospect of the ore on the Canadian side being worked to any great extent at present. If iron furnaces were built there is no doubt the ore would be worked ; in fact Mr. Caldwell offers to contract for the delivery of 25,000 or 50,000 tons or more of ore to a furnace if one were erected. I think some encouragement is needed for the erection of furnaces ; it would require capital, which the people of Algoma have not got. I am aware that there is a tariff of $4 and a bonus of $2 per net ton on pig iron. This should be a considerable inducement, but the condition which is attached to the bonus is that the iron must be produced from Canadian ores. In our part of the Province there are no Canadian mines producing ore, and so the difficulty of complying with this provision is quite serious. We cannot get a furnace built without a guarantee of ore to supply it, and we cannot induce people to mine without the guarantee of a smelter being erected. If capitalists could be got to agree together to mine ore and erect a furnace as well, it would seem to be a feasible way. I think this result might be brought about if the Government was to make a loan to a good, substantial company, which could show that it was possessed of the business experience and ability to carry on this class of work, or guarantee its bonds for a certain amount. The Government could hold the company's property as security, and in this way furnaces might be established and mines opened, and the Government would be secured for the risk. I do not think there is any necessity for the Government to assist in the working of the mines ; if they would assist in the establishment of a furnace it would create a market for the ore, and the mines would certainly be worked. I do not propose that the Government should make the company a gift of the amount, but that they should loan it ; or they might guarantee the company's bonds for twenty years, taking a first lien on the property, and if the company failed to pay the bonds the Government would have the property as an asset. I think this would enable the company to secure the necessary capital and make the undertaking a success. I do not think there would be any difficulty whatever in getting men to undertake the construction of a furnace if these inducements were offered. I feel quite sure that good men could be got to go into the business if they were enabled in some such way to secure the capital on easy terms. But if the Government would give a direct bonus it would be perhaps a greater inducement. I would consider $100,000 a good bonus, and would prefer it in a lump sum in cash ; or, say, when the works were partly completed $25,000 might be advanced, when wholly completed and put in operation another $25,000, when 100,000 tons of ore were raised and treated a third sum of $25,000, and when a similar quantity of ore was put through the remaining sum of $25,000 might be handed over, spreading the payment of the bonus over the space of two years. I think a furnace started with sufficient capital in the hands of good men would secure

Some encouragement needed for erection of furnaces.

the Canadian market. There is no duty on steel rails coming into Canada for railway purposes at the present time. There is a duty on light rails, such as are used for tramways, but none on standard railway rails. If our mines were producing sufficient ore, and we had furnaces and rolling mills in operation and were unable to get reciprocity with the United States, it might be well to put a duty on steel rails; but I am not at all in favor of protective duties. I do not think it would be wise to put on such a duty at the present time, or until our mines were further developed. I would say this, that if the United States continue to charge a duty upon rails manufactured in this country Canada should do likewise; but what would encourage the developing of our mines more than any protective duty would be free entry into the United States for our iron ores. We import steel rails from the United States in considerable quantity. As a general rule the English rails are the cheaper, but at times we can buy rails from American manufacturers to better advantage than from the English. About one-third of the rails laid down on our road were American; we could get them cheaper at the time than we could English rails. Railway companies are often in a hurry for rails, and they can get them from the American manufacturers more quickly than from the English, there is so much delay in getting rails across the Atlantic. For this reason the preference is sometimes given to the American rails, even though they cost a little more I think the C. P. R. have brought a good many of their rails from the States, but they have got their supply mostly in England. If a duty were put on rails I suppose it would have to apply to all countries. I think if our mines were developed and we had furnaces started we could compete with either England or the United States, and should not ask any duty. We have all the raw material, and we have the advantage of not requiring to pay freight; that ought to be protection enough. I think Canadian ore could be shipped to the States at present prices, if there were no prejudice against it; it would depend upon the quality of the ore offered. I do not consider the 75 cents a ton duty on ore going into the States prohibitive at all, owing to the fact that our ore occurs near the surface and can be mined very cheaply; but to handle ore and compete with the Americans it would have to be handled on the same scale that they handle it. They have the very best of railway facilities; they get their ore carried to the water's edge for less than a dollar a ton for railway transit. They have the benefit of the return cargo, but we would have that too. They have ore docks, over which they handle their ore just as grain is handled in an elevator; a vessel is loaded in two or two and a half hours, and to give vesselmen and shippers the same facilities would require the expenditure of a very large sum of money in the construction of railways, ore cars, ore docks, harbor facilities, etc., to enable the mines in Ontario to supply ore to the American market. I think the setting up of furnaces in our own country would soon be an accomplished fact if the capital were obtainable, and these together with the facilities that I speak of for shipping, etc., would no doubt lead to active mining. I believe there would be a ready market for Canadian ore in the States, because as a rule it is richer and better than the American ore. That would be a good beginning for the mining industry, but I think the most important thing of all is the establishment of smelters to supply iron for our own market. It would require double the capital to work the mines and operate the furnaces if the same company undertook the whole work, but I think if a smelting furnace could be got in operation the question of mining would settle itself. I have no doubt those who own ore would be glad of an opportunity to place it in the market. It would require still further capital to erect rolling mills for the manufacture of rails, or plates, or bar iron, but it seems to me that if a smelter were established to produce a good quality of charcoal pig iron all these other things would follow; private capital would be introduced to take

Conmee.

The market for steel rails.

The chance of Canadian ores in the United States market depends on economic handling.

Interdependence of mining and smelting.

Conmee.

hold of and establish rolling mills. I think a charcoal furnace would be the most desirable. No doubt a grant of timber by the Government for the purpose of making charcoal would be an assistance, but what is wanted is capital, something to induce capitalists to go into the business and erect furnaces and the whole plant necessary to produce pig iron. A guarantee of bonds to the extent of $200,000 would go a long way towards furnishing the means to establish the works, or a bonus of $100,000 would be of very great assistance. I think Port Arthur or Fort William are the only places where the necessary facilities can be had for the erection of the works, with convenient supplies of ore and fuel. There is a great deal of pitch pine there, as well as spruce, tamarac and birch, and I understand these are all good for making charcoal. The Port Arthur, Duluth and Western Railway goes through forest for part of the way, and there is plenty of timber within 20 or 30 or 40 miles of Port Arthur of the kinds I have mentioned. These woods are light as compared with maple or beech, but I think about fifty cords could be cut on an acre. The timber has a thrifty growth, the trees stand close together, and while each tree would not cut as much as maple or beech the yield per acre I think would be larger. I have had no experience myself which would enable me to say how many cords per acre can be cut, but I have asked the question of Captain Hooper, who was operating the Beaver mine and cleared a great deal of land for the wood, and he told me that from 45 to 50 cords per acre could be cut; a great deal of it was poplar, but the other kinds yield about the same. Then there is another point in favor of Port Arthur and Fort William in case a coke furnace was built. Vessels taking up coal or coke could carry east pig iron, iron ore or grain, and with return cargoes assured we could depend on getting the cheapest freight rates."

Advantage of Port Arthur and Fort William as seats of the industry.

THOMAS D. LEDYARD'S STATEMENT.

Ledyard.

"I think the proper fuel for a furnace situated in Toronto would be coke, which could be brought here just as cheaply as it can to Chicago, and perhaps a little more cheaply. There should be plenty of room in the market for the production of a furnace having an output of 100 or 150 tons a day. Our investigations led us to believe this to be the case. I have an estimate of the cost of making pig iron by Mr. Henry Kelly, who came over here independently to see my own and other properties, and who is thoroughly posted in mining. He is a member of the Society of Accountants, Philadelphia, and has been employed by some of the largest works in the United States to put their books into proper shape, and in this way he has seen the working of many furnaces. His statement is as follows, and was written after examining the properties in Belmont and Snowdon:

Coke fuel advised for a blast furnace located at Toronto.

'TORONTO, July 19th, 1892.

'DEAR SIR,—The following is my statement of the cost of making Bessemer pig iron in this city, based on my knowledge of the cost of manufacture in Pennsylvania, U.S.A.: Ore at $3.50=$5.78; coke at $4.50=$4.50; limestone at 75 cents=.38. Total cost of materials, $10 66; labor, making, $1.31; labor, repairs, .09; incidentals, .81; salaries, office, etc., .35. Total, $13.22. Yours truly,

HENRY KELLY, Accountant.
Philadelphia, Pa'.

Estimate of cost of production.

"Mr. Kelly was a special expert for the Cambria Iron Company of Johnstown, Pennsylvania, and other companies.

"One thing has operated against the establishment of the ironmaking industry in this Province, namely, the fact that those who wished to engage in it would have to provide all their own ore; while in the United States, for instance, they can go into the open market and buy at any time and in

any quantity at the market price. There is no ore ready to be delivered in Ontario because there are no mines, and as a consequence the starting of the iron industry here would involve the risk and expense of mining the ore as well, which is a very serious consideration when you take into account the large amount of ore that should be on hand before a furnace can be started. For this reason a much larger amount of capital is required than if you were beginning a similar enterprise in the States, where you can buy ore from time to time as it is needed. For instance, take a furnace that would turn out 150 tons of pig iron per day, which would be about 45,000 tons a year To provide a year's supply of ore amounting to fully double that quantity, or say 90,000 tons and pay for it beforehand at say $3.50 per ton, would require the outlay of a very large sum of money—upwards of $300,000. If our mines were first opened and the product exported for a time to the United States, I believe the effect upon the prospect of starting the industry here would be beneficial. I know that men who are moving in the latter direction at the present time are watching with much interest the operations of the Belmont company at that mine. I think an iron blast furnace could be established here even before the mines were worked to great extent if the Government were to give a bonus. Other people besides myself who know of iron deposits say that if there was a furnace in Toronto which would give a fair price for ore there would be no lack of ore, but you would have to go farther away. These properties are about 110 miles from Toronto, but I am told that there is no question of there being a sufficient supply of ore within 200 miles of Toronto. I would not regard 200 miles a long distance to carry iron ore ; half a cent a ton per mile is the rate United States railways charge, and at this rate the cost of bringing it 200 miles would be only $1 per ton. A furnace would give a local market for ore and would use ore that could not be exported on account of not being rich enough in iron, such as hematite running from 45 to 50 per cent. I think Toronto would be as good a place for a coke furnace as any. Besides being a convenient spot at which to assemble the materials, it is a good distributing centre, which is a great advantage. Enough iron is used in Toronto and the country for which Toronto is the distributing point to support a furnace of this kind. I would certainly regard it as a very decided advantage to locate a furnace where there is a considerable local consumption of pig iron. If I were to erect a charcoal furnace I should place it near the mines. The trouble with a charcoal furnace is that it would give you only one brand of iron, and however good it might be the users of iron want a mixture. In the making of malleable castings charcoal iron is the best by all odds, but I am told that even in making carwheels they want a mixture. All the capitalists with whom I have conversed were favorably disposed towards the erection of a furnace ; they thought it was a good enterprise and ought to pay very well, but, from its being to some extent an experiment with a good many risks attached, they felt that they could not get local subscriptions for stock unless the Ontario Government also took some. It was a common opinion among our own people here that our ores were not good, but now that this American company have taken hold of the Belmont mine and are shipping the ores to Pennsylvania they may change their mind. The result of my investigations and negotiations was that we could not get any local capital interested in the scheme without an additional bonus which was looked for from the Ontario Government, and if this were given to a sufficient amount they would subscribe. I got this further promise, that if Toronto people subscribed half the required capital the other half would be furnished by American capitalists. The bonus paid by the Dominion Government upon pig iron manufactured in Canada is now $2 per ton, and will remain at that figure until 30th June, 1897. The $2 rate took effect, I think, on the 1st of July last year, and is

Ledyard.

A hindrance to iron making in Ontario, which demands large capital to start the industry

hence a reason for Government aid.

A furnace would create a local market for ores.

Considerations which influence location.

Capitalists want more bonus.

Ledyard.

payable on the net ton of 2,000 lb. The customs tariff on pig iron is $4 per ton, so that there is a total bonus of $6 per net ton, which ought to be enough. The bonus asked from the Ontario Government is $2 per ton, to be continued for ten years."

THE IRON INDUSTRIES OF ONTARIO.

It would be a mistake to say or assume that our Province is without an iron industry. A metal having such a wide range of uses as iron could hardly be excluded from the industrial arts of any civilized country. Ontario can show a list of some variety, even if the figures do not make an imposing array. The statistics of the last census are not yet available, and therefore the table which follows has been compiled from the census of 1881. It gives the number of establishments in which iron is used as the raw material of manufacture, the number of workers employed in them, the amount of wages paid in the year for labor, the value of the raw material used, and the value of the products of the works.[1]

Statistics of the census of 1881 for iron and steel works.

Industries.	Establishments.	Employés.	Wages.	Value of raw material.	Value of products.
			$	$	$
Agricultural implements.	141	3,201	1,130,475	1,613,093	3,928,411
Blacksmithing	3,586	6,026	1,409,322	1,331,730	3,906,509
Boiler works	17	260	82,492	151,700	271,833
Car and locomotive works	12	1,622	637,460	1,224,826	2,081,702
Cutlery	1	67	26,000	44,000	100,000
Edged tool works	13	337	144,030	164,280	411,550
Engine works	8	560	216,300	452,900	808,000
Fire-proof safe works	2	82	42,500	32,000	88,000
Fittings and foundry work in iron, brass, lead, etc.	75	1,084	396,021	675,458	1,388,805
Foundry and machine works	342	5,021	1,867,977	2,219,798	5,839,467
Gun making	24	38	16,611	8,610	34,095
Lock making	1	95	13,000	10,000	50,000
Nail and tack factories	2	80	35,000	120,000	185,000
Rivet factories	3	27	10,000	45,000	72,000
Rolling mills	1	225	100,000	250,000	400,000
Saw and file cutting	10	165	69,100	147,330	277,400
Scale factories	1	20	7,000	18,000	35,000
Screw factories	1	66	13,700	20,809	50,960
Sewing machine factories	7	604	215,944	170,672	517,246
Spring and axle factories	4	139	46,500	118,300	178,500
Steel making	3	110	33,967	68,760	172,150
Steel barb fence factories	1	3	1,200	4,000	12,000
Tin and sheet-iron works	670	2,049	582,024	994,654	2,178,629
Wire works	2	19	6,900	7,500	22,000
Totals	4,927	21,900	7,103,523	9,883,420	23,009,257

Comparison with other manufactures in the Province.

Compared with all manufacturing industries of the Province for the same census year, the foregoing table shows that the iron industries were 21½ per cent. of all industrial establishments, that the number of workers to which they gave employment was 18½ per cent. of all workingmen engaged in manufactures, that the amount of wages paid to them constituted 23¼ per cent. of the total wage earnings, that the value of raw materials used was nearly 11 per cent. of the total of raw materials, and that the value of finished product was 20 per cent. of the value of all manufactures. These figures demonstrate

[1] Bulletin No. 8 of the census of 1891, which gives numbers of establishments and of workers employed in them, shows that in some branches of the industry there has been increase and in others decrease during the last decade; but the classification is not sufficiently complete to permit of a full comparison being made, and no statistics have yet been published of wages, materials or products for the last census year.

how important a part of the industrial life of the country is taken up by the workers in iron; yet if comparison be made with some other countries it will be found to be a very moderate if not an insignificant part,—with Sweden and Belgium, for instance, or with the states of Pennsylvania, Ohio and Illinois. But it may be more instructive to borrow illustration from three or four centres of the iron industry instead of making a comparison by countries. Comparison with U. S. centres of production.

THE IRON INDUSTRY IN PENNSYLVANIA.

In October of last year I attended the meeting of the American Institute of Mining Engineers held in the city of Reading in Pennsylvinia. Reading has a population of 65,000 It is situated on the Schuylkill river. off all the chief lines of traffic in the state; yet it is a hive of industry, and for more than a hundred years blast furnaces have been producing pig iron in the town and the country tributary to it. In a paper read at the meeting of the Institute by the President of the Board of Trade the following statistics were given of the value of iron manufactures in the city for the year ending September 29, 1892: In the Schuylkill valley.

Stoves	$ 659,000
Boilers and flues	323,000
Hardware, locks and butts	1,650,000
Pig iron, wrought iron, pipe and machinery	8,400,000
Iron beams, bridge work and steel	4,000,000
Bolts, nuts, rivets, etc	1,000,000
Total	$16,032,000

Reading.

These industries give employment to 6,850 people; but they do not embrace all the manufactures of Reading. Other lines of goods produced during the same year, with their values, are shown in the following table:

Hosiery	$ 550,000
Boots and shoes	150,000
Silk and cotton goods	1,725,000
Rope and cordage	600,000
Fire-brick, terra cotta and glass	320,000
Wool and fur hats	3,000,000
Cigars	3,150,000
Total	$9,495,000

More than half of the whole population of the city, I was informed, is supported by its manufactures: and the value of iron products alone, it will be observed, is seventy per cent. of the value of all the products of the iron industries of Ontario in the census year 1880.

South of Reading about twenty miles, on the line of the Reading Railway, and also upon the Schuylkill river, is the town of Pottstown. It has a population of 15,000, and it is said that almost every workingman in the place is employed either in making or manufacturing iron. There are blast furnaces, bridge works, boiler works, stove works, mill iron works, cut nail works, pipe iron works and steel rail and plate works. The last named establishment was started about thirty years ago in the interest of the Reading Railway Company, and after changing hands two or three times it is now controlled by three men organized as the Pottstown Iron Co., with a capital of $1,000,000. The plant consists of a blast furnace which smelts Lake Champlain and other ores high in phosphorus and silicon, producing 800 tons of pig iron weekly; three basic Bessemer converters, the largest of their class in the United States; a mill for making fire-brick to line the converters; rolling mills for rolling boiler and other plate; nail mills, etc. Two thousand men are employed by this company alone, whose yearly earnings foot up $1,000,000. or one seventh as much as all the wages paid by all the iron industries of Ontario in 1880 and this in one town of 15,000 inhabitants. Pottstown.

There are several other active manufacturing towns in the Schuylkill valley, above and below Reading, one of which is Birdstown, made famous recently by the construction in one of its iron-working establishments of the wire gun—which members of the Institute had the privilege of seeing in a partly finished state.

In the Lehigh valley.

Less than fifty miles eastward of the Schuylkill is the Lehigh river, a tributary of the Delaware. From the gap at Mauch Chunk, where the Lehigh breaks through the Blue mountains, down to its mouth, this river is almost one continuous line of blast furnaces and iron works. Chief among these are the works of the Bethlehem Iron Company, with eight blast furnaces for smelting iron ore (Cuba red hematite, Elba specular and New Jersey magnetic—the latter treated by the Edison magnetic separators), a steel plant with four Bessemer and four Siemens open-hearth furnaces whose aggregate steel-making capacity is 915 tons per day, steel rail mill, and forging and machine shops for the manufacture of guns and nickel steel armor plate for the United States navy. These works give employment to over 4,000 men, and the ground occupied by them extends a mile and a quarter along the Lehigh river by a quarter of a mile in width.

South Bethlehem.

In the Ohio Valley.

But the great centre of the iron industry of Pennsylvania as well as of the United States is in the western part of the state, in Allegheny county, whereof Pittsburgh is the chief town. In 1874 there were 11 blast furnaces in this county which produced in that year 143,660 net tons of pig iron, an average per furnace of 13,060 tons; in 1891 the number had increased to 26 and the production to 1,635,531 tons, an average per furnace of 63,289 tons. In 1874 there were also 42 mills and steel works in the county whose total make of crucible, Bessemer and other steels was 23,915 net tons, an average of 570 tons; in 1891 the number of mills and works had grown to 63 and the production to 1,542,921 tons, an average of 24,490 tons.[2]

Allegheny county.

Pittsburgh.

Further and more imposing evidence of the value of the iron industries of this great centre is found in the assessment rolls of the city of Pittsburgh. For the purpose of levying a business tax, every person or firm engaged in mercantile pursuits in the city is obliged to make each year a sworn return of the gross amount of business done, and the business tax is levied thereon. The following list shows the amount of such business in iron and steel for the year ending 31st March, 1893:

Iron and steel industries of Pittsburgh.

Atwood & McCaffrey, foundry,	$ 308,489
A. M. Byers & Co., iron,	875,832
U. Baird, Machinery Co., machinery,	130,000
H. L. Childs & Co., mill supplies,	215,000
Crescent Steel Co., steel,	420,000
The Harmes Machine Department, machinery,	100,000
The Shook Anderson Machine Co.,	120,000
Singer, Nimick & Co., iron,	1,063,339
S. Severance, spikes,	179,000
Smoky City Boiler Works, boilers,	100,000
The Birmingham Iron and Steel Co., iron and steel,	100,000
Charles A. Turner, mill supplies,	125,000
W. G. Price & Co., plumbers,	225,000
Pittsburgh Supply Co., oil well supplies,	525,000
Riter & Conley, boilers, etc.,	1,016,871
Joseph Woodwell & Co., hardware,	208,701
Neal Bros., iron and steel,	100,000
Oil Well Supply Co.,	300,000
McGinnis, Smith & Co., heating apparatus,	100,000
Apollo Iron and Steel Co., iron and steel,	100,000
Bovaird, Seyfang & Co., oil well supplies,	100,000

[2] Report of the American Iron and Steel Association for 1891, p. 70.

Pennsylvania Tube Works, iron,	$1,982,040	
Robinson Rea Machine Co., machinery,	600,000	
The Kelly & Jones Co., steam fitters,	250,000	
Bradley & Co., stoves,	100,000	
Clinton Iron & Steel Co., iron and steel,	550,000	Iron and steel industries of Pittsburgh.
Frick & Lindsay Co., mill supplies,	100,000	
National Tube Works, iron,	200,000	
A. Garrison, Foundry Co., foundry,	515,735	
Jones & Laughlins, iron and steel,	5,500,000	
Wolff, Lane & Co., hardware,	278,486	
Bindley Hardware Co., hardware,	600,000	
Demmier Bros., hardware,	335,000	
Carnegie Steel Co., (Ltd.),	9,582,328	
Benny Bros., machinery,	150,000	
Babcock & Wilcox, boilers,	200,000	
Dilworth, Porter & Co., railway supplies,	1,500,000	
Lyle & McCance, hardware,	127,000	
Steel and Iron Implement Co.,	100,000	
H. K. Porter & Co., locomotives,	437,620	
Standard Mfg. Co., plumbers' supplies,	219,059	
W. A Giles, engines,	100,000	
Nease, McLain & McGinnis, hardware,	120,000	
Brown & Co., steel,	800,000	
McWhinney & Co., hardware,	200,000	
H. Lloyd's Sons & Co., iron,	411,912	
Mackintosh, Hemphill & Co., founders,	890,870	
Joseph C. Lindsay & Co., hardware,	315,000	
Logan, Gregg & Co., hardware,	600,000	
James Rees & Son, engines,	161,046	
Bissell & Co., stoves,	176,000	
Singer Sewing Machine Co.,	100,200	
Standard Sewing Machine Co.,	175,000	
I. N. Scott & Co., agricultural implements,	200,000	
Scoble & Parker, agricultural implements,	205,100	
A. Speer & Sons, plows,	184,328	
John Hall, jr. & Co., agricultural implements,	130,000	
Consolidated Steel Co., wire,	100,000	
Standard Underground Cable Co.,	621,901	
Zug & Co., iron,	795,700	
Schoenberger & Co., iron,	2,613,000	
Howe, Brown & Co., steel,	100.000	
S. Jarvis Adams & Co., foundry,	180,000	
Jarecki Manufacturing Co., pipe,	125,000	
Hainsworth Steel Co.,	1,000,000	
Cold Rolled Steel Co., steel,	250,000	
Hubbard & Co., shovels,	151,714	
Hydraulic Machine Co., machines,	100,000	
Carbon Steel Co., steel,	400,000	
Wm. Clark's Sons & Co., iron,	1,000,000	
Iron City Tool Works, tools,	158,136	
McCullough, Dalzell & Co., crucibles,	200,000	
Pittsburgh Malleable Iron Co., iron,	154,869	
Pittsburgh Bridge Works, iron bridges,	271,660	
Keystone Rolling Mill Co., iron and steel,	848,550	
Linden Steel Co., steel,	698,816	
Moorhead, McLean Co., iron and steel,	914,507	
A. French, Spring Co., springs,	1,180,000	
Westinghouse Machine Co., machinists,	450,000	
McConway, Torley & Co., iron,	1,477,000	
Schiffler Bridge Co., bridges,	500,000	

Iron and steel industries of Pittsburgh.

Seaman, Sleeth & Black, rolls,	$435,000
Marshall Foundry Co., founders,	521,593
R. Munroe & Son, boilers,	250,000
L. M. Morris, foundry,	216,068
Park Bro., & Co., steel,	2,048,546
Pittsburgh Steel Casting Co., steel,	204,072
Scaife Foundry and Machine Co., foundry,	114,738
Totten, Hogg & Co., foundry,	158,300
Oliver & Roberts Wire Co., wire,	1,800,000
Oliver Iron and Steel Co., iron and steel,	2,000,000
Koehler & Strong, scrap,	165,000
Morris & Bailey, steel,	138,000
Phillips, Nimick & Co., iron,	708,975
M. Lanz & Son, nuts, bolts and bricks,	125,000
Lewis Foundry and Machine Co.,	271,677
The Klein Logan Co., tools,	100,000
C. J. Reiling, iron railings,	100,000
Marland, Neely & Co., nuts and bolts,	108,698
Phillips Mining Supply Co.,	100,000
Republic Iron Works,	600,000
Union Foundry and Machine Co.,	150,000

A large business for one city.

Making a total of $59,115,709. But merchants' sales are no doubt included in the list, and so the statement is not to be taken as showing the exact amount of the city's production of iron and steel. Yet after due allowance is made for the business of mercantile houses, the aggregate value of the industries must be a very large sum for one city—probably more than double the value of all the iron and steel products of Ontario establishments in the census year 1880.

GREAT BRITAIN AND THE UNITED STATES.

Growth of pig iron production in the two countries.

The growth of the iron industries of the United States furnishes striking evidence of the progress made by that country during the last quarter of a century, and Great Britain, so long the leader of the world in the production and manufacture of iron and steel, is now reduced to second place. The following table shows how the pace has been kept up by both countries in production of pig iron for a period of twenty years, quantities being expressed in gross tons :[3]

Production of pig iron in Great Britain and the United States during twenty years.

Years.	Great Britain.	United States.	Years.	Great Britain.	United States.
1872	6,741,929	2,548,713	1882	8,586,680	4,623,323
1873	6,566,451	2,560,963	1883	8,529,300	4,595,510
1874	5,991,408	2,401,262	1884	7,811,727	4,097,868
1875	6,365,462	2,023,733	1885	7,415,469	4,044,526
1876	6,555,997	1,868,961	1886	7,009,754	5,683,329
1877	6,608,664	2,066,594	1887	7,559,518	6,417,148
1878	6,381,051	2,301,215	1888	7,998,969	6,489,738
1879	5,995,837	2,741,853	1889	8,322,824	7,603,642
1880	7,749,233	3,835,191	1890	7,904,214	9,202,703
1881	8,144,449	4,144,254	1891	7,406,064	8,279,870

THE INDUSTRY IN GREAT BRITAIN.

An arrest of expansion.

In 1892 the make of pig iron in Great Britain was 6,616,890 tons and in the United States 9,157,000 tons, and it appears likely that the latter country will maintain the supremacy, although it looks as if production would decline 1,000,000 tons this year. In both countries there has been an arrest of expansion, which of course could not long continue at the rate of the last twenty years ; and cautious men may be led to consider whether there is room in the world for many more rival enterprises. The situation in Great Britain

[3] Mineral resources of the United States, 1891, p. 52.

is indeed regarded as serious, and the following extract from the address of Mr. Windsor Richards, president of the Iron and Steel Institute, at the May meeting of that body in London, may be accepted as a trustworthy presentation of it : Richards.

"The present meeting is held under circumstances of great depression and gloom for the iron and steel trades. The year 1892 was, in many respects, one of the very worst those industries have ever known. The production of pig iron fell off to the extent of over 600,000 tons. The production of wrought iron and steel was also much under that of some previous years. The most serious falling off however was in the production of steel rails. The export of rails in 1892 was not much more than one-half that of 1890, while the exports of 1890 were much under those of some previous years. The total falling away in our exports of metal and machinery in 1892 as compared with 1891 amounted to over seven millions sterling. One characteristic of the iron industry of the past year has been the great falling off in the quantity of pig iron made from English ores. The imports from Spain during 1892 amounted to 3¾ millions of tons, equal to a production of 1,800,000 tons of pig iron. The total quantity of pig iron made in this country in that year was 6,616,890 tons, so that 26 per cent. of the whole production was made from imported ores.

A period of depression and gloom.

Imports of ores from Spain.

"It is remarkable how all the principal iron making districts have of late years increased their consumption of imported ores and reduced the use of home ores. In Scotland the make of well-known brands of Scotch foundry iron has been largely reduced from year to year, until now more than 24 per cent. of the production is obtained from foreign ores. South Wales has practically ceased raising iron-stone and depends almost entirely on foreign supplies. Cleveland has immense quantities of phosphoric iron-stone at its door, cheaply won, but 20 per cent. of its total make of pig iron comes from ores carried more than a thousand miles. Even Lancashire and Cumberland, with hematite ores of the highest quality close at hand, have of late years extended their use of Spanish ores. Is it possible for the north of Spain, which in 1892 supplied us with 3¼ millions of tons of ore, to maintain that output for a much longer time? It is generally thought that the most valuable and extensive deposits are being rapidly exhausted, and that some of the most productive mines are not likely to last more than a few years longer. Last month I visited Bilbao and made careful enquiries from competent authorities on the spot, and learned that, with the exception of the large mines owned by the Orconera and Franco-Belge companies, there are no very extensive mines left to be worked. Indeed were it not for the recent successful calcination of the spathic ores which underlie the Rubio ore, the duration of the district at the present rate of output—4 million tons per annum—would have been within measurable distance; but there are very large deposits of spathic ore, the depth and extent being as yet unproved. Calcining operations in the near future will be largely carried on, making the spathic ore which in the raw state contains 43 per cent. of iron, and 25 per cent. carbonic acid, give in the calcined condition 58 per cent. of iron, thus making a very valuable mineral, having only 2 per cent. of moisture as received. Calcining kilns are already erected, one large kiln economically and effectually calcining 1,500 tons of raw ore weekly. It seems probable that this successful dealing with the spathic deposit will extend the life of the district fully ten years. It must be understood however that this length of life does not apply to the Orconera and Franco-Belge properties.

Decrease in consumption of home ores.

Exhausting the Spanish deposits.

"There are large deposits of ores free from phosphorus in the neighborhood of Seville and in the south of Spain that will become available, but considerable sums of English money will have to be expended in opening out the mines and conveying the mineral to the ship; but in the words of Mr. Gill of the Orconera Company, who has seen all the recently discovered large

Richards.

deposits, there is as yet only one Bilbao. Under these circumstances it is natural that our attention should be arrested by the enquiry, whether, if the Spanish supplies were to be suddenly cut off, we could depend wholly on our home mines. The west coast has raised $2\frac{3}{4}$ millions of tons of ore free from phosphorus, and could most probably increase that quantity to produce $1\frac{1}{2}$ millions of tons of pig iron should the demand arise.

Utilizing the phosphoric ores.

"During the twelve months ending December, 1892, the quantity of basic steel made in England was 406,839 tons, of which 108,056 tons were open-hearth steel. In Germany and Luxemburg 2,013,484 tons of steel were made from phosphoric ores, of which quantity 186,252 tons were open-hearth, the balance being basic Bessemer steel.

Value of the basic process to the British mine owners and iron makers.

"Very much more prejudice has existed in England than on the part of continental buyers against the use of steel made by the basic process. This seems only natural when no difficulty existed here in procuring ores free from phosphorus, and in the event of foreign supplies being cut off such prejudice would doubtless quickly disappear. There need therefore be no apprehension of our being able to supply all the iron and steel we may be called upon to produce. Indeed the great trouble seems to be that of being able to procure sufficient work to keep our large establishments employed. We could quickly make ourselves independent of foreign supplies of ores, except in the manufacture of high percentages of manganese in spiegeleisen and ferro-manganese, and in this respect we are entirely dependent on foreign countries, the English spathic ores not being rich enough to give above 10 per cent. manganese in spiegel."

And in the close of his address Mr. Richards said :

Advantages of better organization and improved mechanical arrangements.

"All those who manage steel works either for the production of rails or ship plates, pride themselves on their power of organization, not only to increase output, but to maintain high quality. Then again the ingenuity of our engineers has been called into play to substitute mechanical arrangements for the so-called cheap labor. One cannot fail to observe how few men are employed in a mill turning out 5,000 tons of finished rails weekly. The heavy ingots are conveyed by small locomotives to the rolling mills, are moved to and from the several grooves of the rolls by live rollers, are turned over and carried sideways, rails are rolled in 155 feet lengths, are carried to the saws, are cut, are conveyed away, are placed on hot banks to cool, all by ingenious mechanical contrivances; the same may be said of plate rolling. It is only when the material becomes cold that labor becomes expensive and troublesome; but the more difficult it becomes the surer will machinery be devised to dispense with it.

But there is another side.

"So successful have we all been in economically increasing production that we have inundated and swamped the markets for the time being; at present and for some time past there is not enough work for half the steel-producing power of the country. Thus we go on and we look about in vain for new markets. We compare America with 60 millions of people, having 175,000 miles of railway, with India having 250,000,000 of people and only 17,000 miles of railway, and wonder why under our sway it develops at such a wretchedly slow rate. Where is the trade to come from to keep our workmen employed and our establishments in operation? No one seems to be able to answer this question; but we know that we have had many serious depressions before—though none seem so deep, so prolonged as this. The iron and steel trades may be likened to Pandora's box, from which, once filled with all good things and all bad, everything escaped, the good things back to heaven, and the evils to infest and plague the earth; but there is still left to us that which never deserts us, the inestimable blessing—Hope."

And what are the lessons of the situation for us? Not simply to fold our hands, nor to push a business beyond the limits of our requirements But rather to undertake that which is nearest us, what we most need, and what we can engage in with the best assurance that the effort will not be lost.

VI.

LOCATIONS FOR PIG IRON PRODUCTION.[1]

By John Birkinbine, ex-President American Institute of Mining Engineers.

The advances which brought the United States to first position as a producer of iron ores, pig iron, Bessemer steel and other products naturally drew attention to the importance of developing mineral resources lying dormant, and of establishing industries for the production and manufacture of iron and steel in new locations. To secure this, various methods for encouraging capital to embark in new enterprises have been employed, and the erection of blast furnaces for the production of pig iron has attracted first attention. If the statements of advantage claimed for certain locations as set forth in newspaper articles, or by special announcements in circulars, were all true, the United States would be unusually favored both by the number and the generous distribution of sites which are peculiarly adapted for the production of pig iron, and sections of the country now sparsely populated should develop rapidly into series of adjoining commercial metropoli.

Influence of improved processes in developing mineral resources.

This country of great resources has before it great possibilities, and the liberal distribution of deposits of mineral undoubtedly offer numerous available sites for the establishment of iron-producing or iron-manufacturing plants, while an augmenting population will seek new industrial centres; but the available locations for successful iron manufactures or for future cities are by no means as numerous as the published statements referred to indicate. It is not necessary to assume that all or most of such statements were made without a basis, for in a large number of instances, and possibly in most of them, there have been apparent reasons leading to the assumption that peculiar advantages are possessed by special locations.

Advantages of Location.

Iron ores, fuel or flux, or all three, may occur within convenient distance of a site for a projected blast furnace, and such site may have the added advantages of ample labor at satisfactory prices, good transportation facilities, etc., yet the construction of a blast furnace for the production of pig iron may be followed by financial disaster. The quality of the ore, coal and limestone, the quantities which can be advantageously assembled at the point for producing the metal, the method of winning these raw materials from the ground, and the cost of mining and preparing them for the furnace must enter into any estimate in which the advantages of erecting a new smelting works are considered in comparison with those existing elsewhere.

Conditions of good location for a blast furnace.

A most important consideration is a convenient market for the product, for although improvement in railway construction and operation and competition between different lines of traffic have so reduced the transportation charges that localities hundreds of miles apart are now as close competitors as were those in former years which were separated by but a few miles, the advantage of consumption close at hand is by no means a small factor in determining the financial success or failure of an iron-producing enterprise.

A convenient market for pig iron.

[1] Reproduced from the Engineering Magazine for March, 1893, with the kind permission of the writer and publishers. Mr. Birkinbine is one of the first authorities in the United States on the subject of the iron industry.

Town-booming schemes to avoided.

Of the numerous schemes in which blast furnaces have been used as foundations upon which to start real estate speculation or town "booms," some have had little if any substantial basis; others have possessed one or more of the factors which are essential for the economic production of pig metal, and some which have been started and progressed well on towards completion, have already demonstrated the error of attempting to produce pig iron, or of using a blast furnace as the initiative industrial feature for the establishment of manufacturing centres where other conditions do not demand such centres.

The employés about a blast furnace are not as a rule the best calculated to form nuclei of large populations. Outside of such as are paid salaries, few receive compensation above that given to ordinary labor (except for the extra hours per day which they work), and the labor about blast furnaces cannot be considered as fixed or permanent. Recognizing this, some of the promoters of town ventures secured the promise or the actual establishment of industries which would use a larger number of skilled employés, and generally such as obtained better wages than the blast furnaces offer. Some of these advanced industries rely upon the product of blast furnaces for their raw material, while others may be entirely independent of the furnaces. The industrial plants proposed or erected may either embody new equipments or those moved from other sites and renewed in appointment so as to be creditable to any locality; but in other cases investments have been encouraged by the bodily removal to new sites of plants which have outlived their usefulness in their old locations, largely on account of antiquated equipment to which little or no addition was made for the changed conditions. Disaster may be expected to follow enterprises established at locations which do not, as far as practicable, possess advantages equal or superior to others which have been in operation elsewhere for a term of years.

A new industry, or the opening up of a new industrial district, must meet competition, and break into established trade held by older concerns, a fact which often seems to be lost sight of by those who press the claims of some locations. Under ordinary conditions a new business venture is sufficiently handicapped in securing an entrance into active trade, and needs all the advantage which good equipment, substantial construction, economical management and good financiering bring to assist it in competing for a share of business.

If a blast furnace were necessarily the best starting point for an industrial town or city, the number of such settlements in the older iron-producing districts would be greater than they are, but any one conversant with the location of existing blast furnaces recognizes how many of these, although they have occupied the same location for a number of years, and may have been well managed and operated with skill, have gathered scarcely more than a hamlet about them. On the other hand, a number of instances could be quoted where towns and cities have developed from a single forge or blast furnace, which was erected in such location as to have the advantage of good and cheap raw materials and an ample market; in fact some new important settlements originated from the location of plants which did not possess all of the advantages named. But the exception proves the rule, that the future advance in real estate or the prospective establishment of towns or cities should seldom have a prominent place in estimates when a location is to be chosen for the production of pig iron. The prime considerations should rather be the quantity, quality and cost at which raw materials and labor can be assembled, the character of pig iron which can be made, and the market offered for its sale.

The prime considerations of suitable locality.

The Lessons of Experience.

Elements of success and failure.

An examination of the development of the pig iron industry of the United States demonstrates the extent to which success has been and will continue to be affected by location, and a retrospect of the history of existing and

apparently prosperous furnaces shows how many have met with financial difficulties, necessitating change of ownership or of management, while today close attention and economy are essential for their continued activity.

Quality, quantity and cost of raw material.

If abundance of raw material is required there would be no necessity for the number of idle iron ore mines which today are scattered through some of the older iron-producing districts, convenient to fuel supplies; but the quality and the cost of winning the ore, as well as the quantity, must be considered. The material won from some of these idle mines was of a very satisfactory character for the production of metal in demand, until changed conditions of trade required ore of different composition; although some of the mines which are inactive produce ore of a quality equal or superior to that largely used in other sections of the country where the deposits are newer or can be worked more cheaply. Other mines have been wrought until the extraction of the ore renders insufficient profit to permit competition with richer ores brought from long distances.

Cheapness and supply of raw materials not alone sufficient.

If the abundance of satisfactory fuel obtained close to the plants were the chief necessity for economical operation of blast furnaces, and if this could not be off-set by other advantages there would be no excuse for the magnificent iron and steel industry centered at Chicago; for there the blast furnaces have no raw materials near at hand, except the limestone, and the per diem rates of labor average higher than in some other sections of the country where pig iron is made. On the other hand, if an abundant supply of iron ore off-set the advantage of near fuel and a good market, the enormous output of the blast furnaces in the vicinity of Pittsburgh would seem to be produced at a decided disadvantage, for with the exception of the local mill cinder and a partial dependence of some outlying furnaces upon local carbonates and brown hematites, all of the iron made in Pittsburgh and vicinity, in the Shenango valley of Pennsylvania and the Mahoning valley of Ohio, as well as that produced about Wheeling, West Virginia, and Johnstown, Pennsylvania, is obtained by smelting iron ores brought from lake Superior.

Decline of number of furnaces, and increase of production.

The surroundings which several decades ago made a location advantageous for the smelting of iron ores may have less weight in determining the erection of a blast furnace plant at the present time, several causes combining to affect the influences which certain conditions exert. Owing to the increased production of blast furnaces now constructed, due to the average size, the general use of richer ore mixtures, and the more intelligent management which is bestowed upon the operation of the existing plants, the number of blast furnaces in the United States, either active or likely to be in operation, has declined since 1881, when 717 were recorded. In 1890—the year of our greatest pig iron output—but 562 furnaces were on the active list; of these but 311 were in operation at the close of 1890, being a smaller number than in any of the preceding twelve years with but three exceptions (1883, 1884, 1885), in each of which the pig iron output was less than half of what it was in 1890. The production of pig iron in the years 1891 and 1892 did not reach that of 1890, but owing to some new plants having been completed or blown in the number of furnaces was slightly increased. The record shows that in 1890 there were 562 furnaces on the active list, with an output of 9,202,703 gross tons; in 1891 the furnaces numbered 569, and the output was 8,279,870 gross tons; and in 1892, 564 furnaces were reported, all of which however were not in operation, the tonnage for the year being 9,157,000 gross tons.

Economy of centralizing the industry and increasing the capacity of furnaces.

Therefore an increased output of pig iron is secured from a decreased number of blast furnaces; and as there is a growing tendency to centralize industries (groups of furnaces under one management becoming more common) there must necessarily be fewer specially available locations at the present time than formerly.

A quarter of a century ago a blast furnace which averaged from thirty to thirty-five gross tons of pig iron daily was recognized as of large size and doing excellent work. Now, a production exceeding two hundred tons per day by blast furnaces is not considered remarkable, and where a number of large structures are combined under one management they present a problem for assembling raw materials vastly different from that of the average furnace twenty-five years ago.

With the perfection of mining appliances, the intelligent management of mines, the facilities for winning or transporting ores, fuel and flux, there may be really less personal supervision necessary in assembling the raw materials for one of the large plants than was demanded of the managers of the smaller ones, who had to rehandle the material and furnish at least a part of the transportation. But for the larger plants the basis of supply must necessarily be larger. Increased tonnage of ore, fuel and flux demands greater available supplies, and hence dependence upon merely local deposits of iron ore is now uncommon. Advances in the technology of blast furnace operation and the increasing demand for metal of special chemical compositions also affect the reliance which may be placed upon local deposits of iron ores, for blast furnace managers must work within narrow limits as to the character of pig iron made. Hence the location selected for plants should be accessible to supplies of ores from which such mixtures can be made as will permit of producing not only the grade but the quality of metal required, at prices which admit of manufacturing it advantageously so as to meet the available market.

Large plants demand large basis for supplies.

Influence of the Bessemer Process.

Development of the lake Superior iron regions.

The development of the lake Superior region, which up to the close of 1892 contributed more than 74,000,000 gross tons of iron ore, is not alone due to the high percentage of iron representing the average of the ore produced, for the variety and composition of the ores which have been mined, and which fit them for different purposes, have had a marked influence in this development. In view of the generally-accepted belief in the prime necessity of ores of Bessemer grade, it may sound peculiar to assert that had all of the iron ores won from the lake Superior district been sufficiently low in phosphorus to be acceptable for the production of pig iron for the Bessemer process, the development of this district would have been less rapid than it has been as a producer of the various grades of iron ore.

To emphasize this fact it is unnecessary to go further back in history than a few years, for if an interval of five years ending December 31, 1891, be taken and the proportionate amounts of Bessemer and other kinds of pig iron produced are tabulated, such statement shows that in the year 1887, 44.81 per cent. of the total pig iron output of the country was of the Bessemer quality. In 1888 this percentage was reduced to 40.65 per cent., the total output of pig iron being practically the same as in 1887. In 1889 there was an increase of more than 1,000,000 gross tons in the annual production of the country, and in that year the quantity of Bessemer pig iron made was 41.45 per cent. of the total. Another increase of more than 1,500,000 tons brought the pig iron made in the United States in 1890 to a total of 9,202,703 gross tons, of which 44.47 per cent. was of Bessemer quality. The year 1891 showed a decline from the production of 1890 of nearly 1,000,000 tons, and in that year 41.94 per cent. of the total was of Bessemer grade. The figures which have just been compiled for the year 1892 indicate that out of the total production of pig iron, 9,157,000 gross tons, 48.53 per cent. was of Bessemer quality.

Increase in make of Bessemer iron and steel.

Effect upon location of furnaces.

The growth of the Bessemer steel manufacture in this country has been phenomenal, continuously increasing in twenty-five years from a product of 3,000 tons to one of more than 14,000 000 gross tons, such an industry

necessarily exerting a very marked influence upon the location of the furnaces which supply the metal for it, and upon the development of iron ores which are used in these furnaces. It is probable that the majority of persons suppose the great steel works at Chicago, Pittsburgh, Baltimore, Harrisburg, Johnstown, Scranton, Bethelem, Troy, etc., to have been located on account of blast furnaces connected with them. It is undoubtedly true that some of these plants owe their existence to an original forge or blast furnace, but an investigation will show that, properly speaking, the existing blast furnaces were located at these points because of the steel works, and are established so as to supply to large industrial plants the raw material upon which they must depend.

Influence of Foundry and Rolling-mill Trade.

Convenience to market affects location of furnaces producing foundry and mill pig.

In a similar manner it may be shown that most of the blast furnaces which are producing pig iron of grades particularly adapted for the foundry or rolling-mill trade owe their situation more to convenience to a market for the product, than to being specially near to supplies of fuel or of ore peculiarly suited for the product made. Taking the five years 1887, 1888, 1889, 1890 and 1891, the figures show that, while the blast furnaces located in the vicinity of Pittsburgh and in western Pennsylvania and eastern Ohio increased their total output of pig iron nearly 50 per cent., much of this growth was in the production of Bessemer pig iron, the annual output of which augmented nearly 80 per cent. But on the other hand, while the state of Illinois increased its total production of pig iron one-third, its output of Bessemer was augmented but one-tenth in the five years named: that is, in spite of the state of Alabama trebling its output of foundry and mill pig iron in five years, and other southern states adding to the volume of this class of metal, the state of Illinois, with its large steel industry, accessible to liberal supplies of iron ore suitable for producing Bessemer pig iron, increased the quantity of ordinary pig metal produced three times as rapidly as that used for Bessemer purposes. The advance figures of pig iron production for the year 1892, just published, show a decided increase in the quantity of Bessemer pig iron made, the tonnage and the proportion of this metal being greater than in any other year. At present writing the relative amounts for specific districts cannot be given exactly, but a comparison of the records of the years 1887 and 1892 indicate the following: In the Pittsburgh district the output of Bessemer pig iron was more than double, while the total of all kinds of pig metal increased less than 80 per cent., showing a gain in Bessemer pig iron at the expense of mill and foundry iron. Similarly the greater portion of the advance in Illinois last year was in Bessemer pig iron, the increase in six years being 88 per cent. in the production of total pig iron, and 63 per cent. in that of Bessemer pig iron. Alabama's product, none of which was Bessemer pig iron, was two and one-half times greater in 1892 than in 1887.

General Conclusions.

Quantity, quality and market cost are the essence of suitable location.

The influence of location upon the pig iron industry would seem therefore to be based not only upon the possibility of assembling the raw materials, but also upon the opportunities for marketing the product advantageously. A blast furnace may act temporarily as a sign board for a real estate "boom," although its operation may be at a financial loss, but ultimately dividends or profit must come from it, or failure will be written against it. A smelting plant may instil life into a district, and cause the exploitation of old or the development of new iron ore mines; but unless the ore supply is ample, its quality such as is in demand, and the winning of the ore at low cost can be carried on for a term of years, the success of the enterprise is problematical.

The continued existence and evidences of prosperity of some of the

plants located in sections of the country where the use of local ores is practically abandoned, and the late reconstruction of some of these plants to depend upon ores brought from distant points, indicate the importance of convenience to market and an established trade. The enormous output of iron ore from the lake Superior district, which is conveyed by rail from the mines to extensive shipping docks, loaded on vessels which carry it to equally extensive receiving docks, and again transported on cars for points of consumption from 300 to 1,000 miles from the mines, demonstrates the growing appreciation of high-grade ores.

A tendency to centralization.

The extensive plants distant from ores or fuel, or both, which have been established near important commercial centres, and the concentration of allied industries at these points, evidence the general tendency of iron production to become centralized in a comparatively small number of locations.

As the rapid increase of the population of the country changes the requirements of different sections, and consumers of iron and its manufactures multiply rapidly, deposits of ore yet unexploited await the local demand for metal which will bring these ores and fuel for smelting them together. It is probable that some future industries will occupy territory which years ago or quite lately was developed in part by ventures which failed because they were in advance of the necessities of the times: the fact that some of these earlier attempts proved disastrous may act as a check on improvements in sections which would sustain a considerable and increasing industry.

Premature enterprise.

Deception as to the quantity of manufactured material required in certain districts has cost enthusiastic projectors much loss, and in some cases has condemned by premature efforts enterprises which would prove successful later. The apparent quantities of iron used often offers inducement to believe that a large local market exists, but these quantities when analyzed show that such varieties of metal must be made, and that so many minor industries must be established to transform the crude material into the merchantable shapes demanded, that years elapse before new blast furnace plants overcome the difficulties which await them.

Influence of progress in the metallurgy of iron.

The requirements of the steel works for iron of special composition has been followed by foundries and mills making more rigid specifications; and this in turn has influenced the ores in demand by blast furnaces. Progress in iron metallurgy has shown where economies can be introduced which reduce the fuel and labor per ton of iron made, and an appreciation of the relative values of different percentages of iron in ores has increased the demand for those which may be classed as rich in iron. Each year shows an increase in the average percentage of iron in the ore mixtures used in American blast furnaces and longer distances covered by the rich ores in reaching points of consumption. It is probable that future advances may be in the direction of conveying fuel to meet these ores, particularly if the meeting points furnish good market facilities for the product, and that the use of lean ores will be chiefly in connection with great local advantages as to the other features which go to make up successful blast furnace enterprises.

VII.

NICKEL AND COPPER.

Ores of nickel and copper in the Sudbury district.

The Sudbury district continues to be searched for copper and nickel, and discoveries of the ores of these metals continue to be made in various localities. The area is now shown to be of large extent; but the limits of it are not defined; neither is it certain that every body of ore even in territory most familiar to prospectors has yet been discovered. The close growth of small timber on tracts swept over by forest fires twenty or twenty-five years ago hide out-croppings of ore, or the familiar surface signs by which its presence is indicated, from any but the most careful examination, while the alternation of rocky range and swamp land greatly increase the difficulty of traversing the country. It is not unlikely therefore that the diligent prospector will be rewarded by new and perhaps important discoveries of ore for some time to come at points convenient to existing railway lines, and that it will be many years before the whole of the nickel and copper-bearing formations are delimited on the maps of the country. But what is already known of the extent of the ore bodies, both by deep workings in the mines and the test pits of exploring parties, leaves no doubt in the minds of practical men who have examined the district that nickel and copper are there in illimitable amount; and the strong probability is that a hundred years hence the supply will appear to be as inexhaustible as it is to the miners and explorers of to-day. It is likely too that other parts of the Province besides the Sudbury district will be found to yield both nickel and copper. The Huronian belt in which the known deposits lie extends from the north shore of lake Huron across the Province to the Quebec boundary at Abbitibbi lake, a distance of 300 miles, the breadth of which is about 75 miles.—but embracing some Laurentian areas. On the shore of lake Huron copper and nickel were discovered in this belt nearly fifty years ago, and far to the northeastward of Sudbury prospectors report that they have observed indications of the same ores. Of course the character of the Huronian rocks is not uniform over a wide extent, and great local differences may be looked for in an area of 22,000 square miles; but it is certain that all the chalcopyrite and nickeliferous pyrrhotite of this great Huronian belt are not confined to one or two townships in the vicinity of Sudbury. During the past year too a discovery is reported on Lake-of-the-Woods which may be only the beginning of valuable finds there. At any rate further prospecting in that region ought to be encouraged by the history of exploration in the Sudbury district. Interest has also been recently revived in the Bruce Mines locality, and possibly the old workings there which were carried on with so much spirit for thirty years—beginning with 1846 and ending with 1876—may once again become the scene of an active industry. It is by no means certain that those mines could not be made to pay under modern methods of working and with the facilities for transportation which are now provided.

Extent of the Huronian belt in which the ores are found.

Discovery on Lake-of-the-Woods.

Bruce Mines.

Copper on Point Mamainse.

Copper ore and native copper on Point Mamainse.

A locality of bright promise is Point Mamainse on the east coast of lake Superior, where development work has been undertaken during the past year, and to which reference is made in the Report of the Inspector of Mines, who visited the place last summer. The following interesting account of this property and the nature of the work undertaken upon it was furnished me last November by H. S. Sibley of Detroit, in the course of an interview:

Sibley.

"I am one of two trustees holding for a syndicate the Mamainse copper locations on the east coast of lake Superior. They consist of 11,200 acres,

Sibley.

which were purchased from the Crown by the Montreal Mining Company in 1856. A little prospecting was done by Joshua Coatsworth about 1858, and afterwards by the Ontario Mineral Lands Company in the winter of 1881-2. Two small exploring shafts were sunk in the conglomerate on the Pancake location. This bed is 9 to 14 feet thick and carries one to two per cent. of native copper. No further work was attempted until the autumn of 1891, when a party with Captain T. H. Trethewey in charge was sent up to explore with a diamond drill outfit. Drilling was carried on upon five veins to the extent of 3,643 feet, and to 357 feet on a conglomerate bed; the cores showed native copper to depths of 40 to 320 feet in the veins. The veins vary in width from 3 to 12 feet, and consist of calcspar and fragments of wall rock (conglomerate and trap) cemented by native copper. Jasper pebbles are also found in the veins. In 1892 drilling was continued until July, but in June work was commenced on an exploring shaft 7 by 9 feet, which was carried down upon one of the veins to a depth of 32 feet. A stream runs along the course of this vein, crossing and re-crossing it at intervals, so that some difficulty was experienced in keeping the shaft free from water with the methods at control. The ore was found to be rich throughout the whole depth of the shaft, and so satisfactory was it that the men were set at work to strip the vein and make open cuts upon it at various points for a distance of 1,600 feet; the width varies from 3 to 6 feet. The course of this vein is a little west of north and lies between amygdaloid trap on the west side for foot wall and conglomerate on the east side for hanging wall, showing a lateral thrust of 90 feet. About five tons of ore was taken out of the shaft, from which fair samples were selected and sent to the St. Louis sampling and testing works in August. Following is the report made to me by the manager of these works:

Extent of the locations.

Exploring with diamond drill.

Sinking an exploration shaft.

'St. Louis, Mo., September 20, 1892.

'H. S. Sibley, Esq., 80 Griswold street, Detroit.

'Dear Sir,—We have just wired you results of tests of the two lots of copper ore sent us, and we herewith present more fully the details of these tests. The larger sample lot, weighing 1,196 lb. net, was crushed in jaw crusher and run through our 3-stamp battery to separate the rock material and finer copper from the coarse metallic copper. The former as tailings were carefully saved in settling tanks, weighed and sampled and assayed for copper and silver. The coarser metallic copper was carefully sampled down three times to secure three separate samples in order to secure a better check on a difficult material to sample. These three samples were assayed for copper and silver separately and the average taken. As a result of all these operations we find the lot to contain 22.78 per cent. metallic copper and a trace of silver. The other sample lot marked gray ore was crushed in a jaw crusher and rolls until it was fine enough to quarter down to sample. An assay for copper and silver gave the following results: Copper, 18.84 per cent.; silver, 1.8 oz. per ton. We regret that owing to the great difficulty in handling such obstinate material we have not been able to give you results sooner, but trust they will be in time to serve your purpose. Yours truly,

Analysis of the ore showing a high percentage of copper.

'St. Louis Sampling and Testing Works,

'William B. Potter, Manager.'

"The gray copper ore is found generally throughout the vein, but chiefly on the foot wall. The native copper ore is generally disseminated from wall to wall. The trustees have given an option on the property to a Detroit syndicate, by whom operations to sink the shaft to a depth of 500 feet will be carried on through the winter. This work it is hoped will be finished in ten months. Air compressor, hoisting engine, boilers, drills and all necessary supplies were delivered at Point Mamainse on the 17th of November."

Sinking the shaft to a depth of 500 feet.

Geological formation.

The geological formation at Point Mamainse is the same as that of Keweenaw point on the south shore, where are located the great copper mines of Michigan.

The Production of Nickel.

Output of the Sudbury works.

The quantities of ore mined and smelted in the Sudbury district last year are given on page 8 of this Report. The product of the furnaces, consisting of ordinary and bessemerized matte, held of metallic nickel 2,082 tons, of copper 1,936 tons, and of cobalt 8½ tons. These figures of metallic contents are estimates computed from the analyses of sample lots, and are no doubt as accurate as such estimates can be made; they are so accepted by sellers and buyers of the matte. The whole matte product of the several furnaces is sent out of the country to be refined, some of it to Great Britain, some to France, but the greater portion of it to the United States. There is in the latter country an extra demand owing to the use of nickel as an alloy with steel in the manufacture of armor plate for battle ships. In 1891 the quantity of nickel contained in Canadian matte smelted in the United States was 2,000,000 pounds, some of which went into the general market, but a considerable amount of it was the matte purchased by the Navy Department. This latter is worked up by contract, the copper being taken out and the nickel and iron being left as oxide, in which form it is delivered to the steel works at Bethlehem and Homestead to furnish the nickel for armor plates.[1] There are at present four smelting or refining works in the United States for treating nickel and copper mattes, viz.: The works of Joseph Wharton at Camden, New Jersey; those of the Orford Copper Co. at Constable Hook in the same state; those of the Emmens Metal Company at Youngwood in Pennsylvania; and those of the Canadian Copper Co. near Cleveland. Until recently Joseph Wharton had a monopoly of nickel production in the United States, and his mine at Lancaster Gap in Pennsylvania produced the bulk of the ore treated at his refining works. But since the beginning of 1889 Sudbury has been brought into competition with it, and the result has been the closing at the end of 1891 of the Lancaster Gap mine. So that in 1892 the product of the nickel smelters will be all from Canada, except occasional small amounts from Mine LaMotte, and from Nevada, Oregon and the mines near Webster, North Carolina.[2] The following table gives the total nickel product of the United States for the sixteen years 1876-91, together with the value of the same and the value per pound:

Markets for the matte.

Refining works in the United States.

The Gap mine closed down.

Nickel production of the United States.

Year.	Quantity.	Value.	Value per lb.
	lb.	$	cents.
1876	201,367	523,554	260
1877	188,211	301,138	160
1878	150,890	165,979	110
1879	145,120	162,534	112
1880	233,893	257,282	110
1881	265,668	292,235	110
1882	281,616	309,777	110
1883	58,800	52,920	90
1884	64,550	48,412	75
1885	277,904	179,975	64.4
1886	214,992	127,157	59.14
1887	205,566	133,200	64.75
1888	204,328	127,632	62.46
1889	252,663	151,598	60
1890	223,488	134,092	60
1891	118,498	76,024	64
Totals	3,087,554	3,043,509	98.57

[1] Mineral Resources of the United States, 1891, p. 167. [2] Ib. p. 167.

A significant comparison.

The nickel contents of the matte produced at Sudbury furnaces last year therefore are greater than all the nickel produced by United States mines in sixteen years by 1,076,446 pounds. It will be observed also that the price of nickel as computed from values of the United States product has fallen very materially since 1876. This drop is due chiefly to the working of the New Caledonia mines, by which the world's production was largely increased. Canadian nickel has had a less noticeable effect, but no doubt for the reason that price is determined now mainly by the cost of refining. Yet the ruling price in the London market last year was about 42 cents per pound, while in the New York market in the latter part of the year quotations when given ranged from 48 to 52 cents—the protection afforded by the United States tariff of 15 cents per pound serving to keep up the higher rate in that country. But these prices are presumably for commercial nickel, which is not pure fine.

Fall in prices, and the cause.

Methods of Extracting the Metal.

The wet process as described by Prof. Roberts-Austen.

There are numerous methods already patented for treating ores containing nickel, copper and cobalt, but almost all of them follow the wet process. In a subsequent section of this Report details of treatment are given in a paper by Mons. Levat, and here it may be interesting to give a general description of the process from the pen of Prof. Roberts-Austen, of the Royal College of Science, England :

Roasting the ore.

"The wet method for the extraction of nickel and cobalt from a complex regulus or arsenide consist, in the first place, of a roasting operation having for its object the volatilization of the sulphur and arsenic, and it may be antimony, and the conversion of the iron nickel, cobalt and other metals present into oxides. Ferric oxide formed in this manner at a high temperature is but little soluble in acids, whilst the other oxides may be readily dissolved.

Dissolving oxides with acid.

On treating the roasted material repeatedly with hydrochloric acid or with dilute sulphuric acid, a residue is obtained containing but little or no cobalt or nickel, and consisting mainly of ferric oxide. Some iron will however have passed into solution. Should the solution contain lead, bismuth or copper, these metals may be precipitated by sulphuretted hydrogen ; but it is customary to precipitate the copper at a later stage of the operations. The bismuth too may be precipitated from a hydrochloric acid solution by dilution with water.

Precipitating the iron.

"The next operation consists in the precipitation of the iron. Any ferrous oxide which may have passed into solution is converted into ferric oxide by careful addition of chloride of lime, followed by the addition of lime, which precipitates the iron. Arsenate of iron is at the same time also precipitated if arsenic is present. Should the temperature of the solution exceed 40°C. some nickel and cobalt are precipitated, as also is some copper.

"Instead of an addition of lime as the precipitant, caustic soda or sodium carbonate is occasionally employed to prevent the precipitation of calcium sulphate when working with sulphuric acid solutions. Care must be taken to avoid using an excess of the precipitant, as the precipitation is a fractional one, and as soon as the iron has been precipitated oxides of the other metals present begin to be thrown down.

Precipitation of copper,

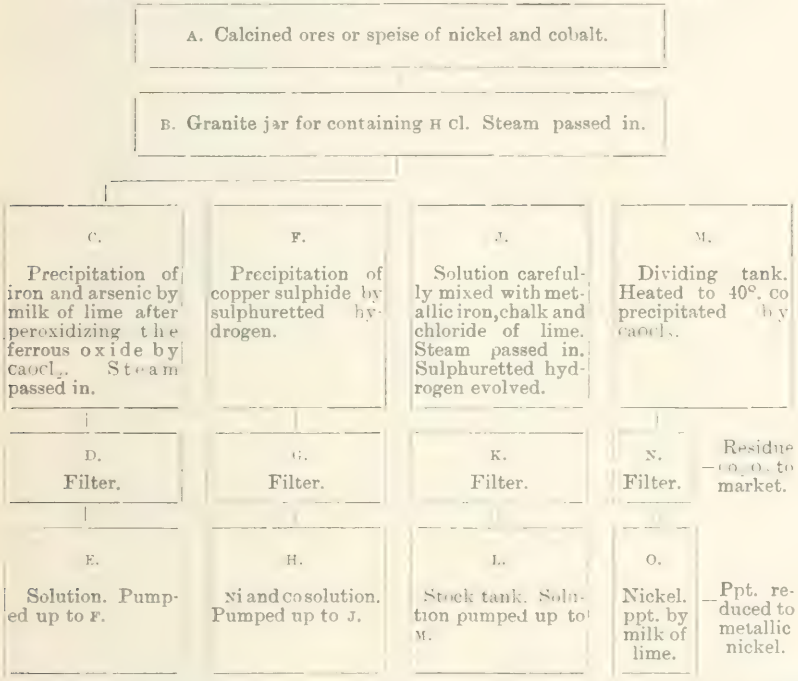
"The next stage of the process consists in the precipitation of the copper. This is effected by raising the temperature of the solution to 70°C., and then precipitating the copper by the careful addition of either calcium carbonate, milk of lime, or a solution of soda. If an excess of the precipitant is employed, nickel will be thrown down. When a test with potassium ferro-cyanide shows that the whole of the copper has been thrown down, the cobalt is precipitated from the filtered solution by the careful addition of a solution of chloride of lime to the perfectly neutral, hot and not too dilute filtrate. If too much chloride of lime is added the precipitate becomes nickeliferous, and this must be carefully avoided. The nickel is next precipitated, either by calcium car-

cobalt

bonate, milk of lime, or soda. The nickel hydrate is filtered, dried, heated with sodium carbonate, to decompose any calcium sulphate that may be present, washed with acidulated water, and finally dried and reduced by carbonaceous materials to the metallic state. and nickel.

"This process being dependent on the fractional precipitation with the same precipitants of the several metals present in the ore or metallurgical product under treatment, is frequently subject to slight alterations of procedure, and the following is a description of the process as carried out at a works in the United Kingdom. A special process described

WET PROCESS FOR EXTRACTING NICKEL AND COBALT.


A. Calcined ores or speise of nickel and cobalt.
B. Granite jar for containing H Cl. Steam passed in.
C. Precipitation of iron and arsenic by milk of lime after peroxidizing the ferrous oxide by $CaOCl_2$. Steam passed in.
F. Precipitation of copper sulphide by sulphuretted hydrogen.
J. Solution carefully mixed with metallic iron, chalk and chloride of lime. Steam passed in. Sulphuretted hydrogen evolved.
M. Dividing tank. Heated to 40°. Co precipitated by $CaOCl_2$.
D. Filter.
G. Filter.
K. Filter.
N. Filter.
Residue — Co, O. to market.
E. Solution. Pumped up to F.
H. Ni and Co solution. Pumped up to J.
L. Stock tank. Solution pumped up to M.
O. Nickel. ppt. by milk of lime.
Ppt. reduced to metallic nickel.

Wet process for extracting nickel and cobalt.

"About 3 cwt of fine ore or speise A that has been thoroughly roasted is charged with hydrochloric acid in granite jars, into which steam is passed. The mass is kept boiling for twelve hours. It is allowed to settle and run off into tubs C. Steam is conducted into the tubs, and when the liquid begins to boil bleaching powder (chloride of lime) is added to peroxidize the iron, and the mass is allowed to boil for about three hours. The arsenic and iron come down together. If no iron be present in the solution some must be added. The liquid is then run off through filters D, to underground tanks E, whence it is pumped to tanks F, in which the mass is treated with sulphuretted hydrogen. Adjoining these tanks, of which there are six, there are also three lead retorts, in which sulphuretted hydrogen is produced. In these tanks the copper is precipitated and the nickel and cobalt solution is strained through filters G, and drains into a second underground tank H. It is then pumped into a tank J, and there successively mixed with iron, chalk, chloride of lime, and water from tubs placed above the tank, with a view to precipitate, first, any copper that may have passed into solution during filtration, and then the iron which has taken the place of the copper The charge is first boiled by the aid of steam pipes so as to expel the sulphuretted hydrogen. It is then run off to a tank L for stock. It is next pumped up into a dividing tank M, and heated with chloride of lime, the cobalt being precipitated as oxide at a temperature of 40°. The solution containing nickel is allowed to run off into

another tank o, in which milk of lime is added, and the nickel precipitated as hydrated oxide. The liquid is allowed to run off as waste. The oxides are pumped into presses, and the water is drained off. The nickel oxide is dried on the roof of a muffle, heated and crushed. It is then mixed with charcoal and heated in a crucible in a reducing furnace for eight or twelve hours. A rough powder is obtained and in this form the metal is sold, or the nickel oxide is mixed into a paste with flour and water, which is heated and cut into cubes. These cubes are placed in crucibles with charcoal and heated to a temperature above the melting power of copper. The nickel oxide is reduced by the charcoal and by the carbonized flour. The metal does not melt, but preserves the form of cubes. The cobalt oxide is removed from the dividing tanks to stone jars and treated by a process similar to that described so as to remove the last trace of nickel. The cobalt is finally sent to the market in the form of oxide."[3]

Price of nickel maintained by cost of refining process.

It will be readily understood from the complexity of this process that it must be an expensive one; hence the high price which fine nickel has maintained. But there are various methods of the wet process, some of which are of recent invention, and possibly the cost of production may be somewhat reduced by them.

A new wet process to be tested at Port Colborne, in which gypsum will be utilized.

One of these is soon to be tested at the village of Port Colborne at the head of the Welland canal, where advantage will be taken of the supply of natural gas there for fuel. Gypsum supplied from mines in the adjoining county of Haldimand is to be largely used under this method, and hope is entertained that the sulphuric acid obtained as a bye-product will very considerably reduce the cost of producing the refined metal. The results of this method are awaited with much interest.

Dry processes.

As to dry processes, including reduction of oxide by carbon in furnaces or crucibles and concentration in sulphide or arsenide and subsequent smelting in reverberatory or blast furnaces, there does not yet appear to be absolute certainty that such methods can be successfully and economically applied to the treatment of nickel ores through all stages to the refined metal: but the metallurgy of nickel is so recent a subject of investigation and experiment that no one will be so bold as to say that the last word has been spoken upon it.[4]

Production and Price.

Growth of the industry and fall in price of the metal.

Seventeen years ago nickel in the United States was worth $2.60 per pound. Twelve years ago it had fallen to $1.10, the New Caledonia mines having been discovered and opened in the interval. At that time the world's yearly production of nickel was about 1,000 tons. Last year the price fell in the United States to fifty cents per pound, and in Great Britain to 42 cents. But the world's production had then increased to 6,000 tons, of which

[3] An Introduction to the Study of Metallurgy pp. 268-71.

[4] While this Report is going through the press an interesting correspondence is being carried on upon this subject in the Engineering and Mining Journal of New York, between Robert M. Thompson, President of the Orford Copper Company, and Dr. Stephen H. Emmens, President of the Emmens Metal Company. The following letter from Mr. Thompson is printed in the Journal of June 17th: "In your issue of June 3rd I note a very interesting letter from Professor Emmens headed 'Nickel Winning,' in which he says, 'No wholly dry process hitherto employed is capable of separating cobalt, or even (to a thoroughly satisfactory extent) copper, arsenic and manganese from nickel;' and referring to the Canadian pyrrhotite ores, 'The metal produced by dry methods from such a raw material is not fitted for fine uses.' In reply let me say that the following assays were made by the same chemist for nickel: Wharton's grain nickel, 99.39 per cent.; Martino's disc nickel (finest foreign nickel), 99.06 per cent.; Orford nickel, produced by exclusively dry process from Canadian pyrrhotite ores, 99.23 per cent. As to the quality of the Orford nickel, while I do not claim it is yet as perfect as we hope it soon will be, yet one of the largest consumers of nickel in the country writes me: 'In some respects your nickel is superior to any we have ever used. The metal is very white and remarkably soft and ductile, both of which points are of the greatest value.' Knowing Professor Emmens' interest in the metallurgy of nickel, I am sure he will be pleased to see what progress has been made in the dry process for treating this metal." But notwithstanding this assurance, Dr. Emmens does not appear to be wholly satisfied as to the merits of the process.

Ontario produced about one-third and New Caledonia two-thirds. Should increase continue at the same rate for the next ten or twelve years we shall doubtless see great activity in mining, smelting and treating operations in this Province, especially should improvement continue to be made in processes, and prices fall as a consequence. It will not be surprising if in less than ten years prices have fallen to 25, or 20, or even 15 cents per pound, and in that event a large increase may be expected to take place in consumption. Assuming that no larger or better deposits of the ore are discovered elsewhere, what are the prospects of nickel mining in this Province in the event of a growing demand? The answer to this question may be found possibly in the words of the last United States Census Report on Mineral Industries. Referring to nickel and cobalt mining in that country in 1889, the writer says the great feature of the year was "the diversion of all attention in nickel mining to the nickel-bearing copper ores of the Sudbury region in Canada." And he goes on to say: "The course of development showed conclusively that nickel can be produced there for a less cost than anywhere else in the world, so far as the present capacity of the known mines permit of an opinion." And referring to the New Caledonia mines farther on the same writer says: "At present the mines are less influential than those of Canada, for although the ores are fully as rich, labor is not so good, and for imported laborers the climate is bad. The ores are found in v-shaped pockets in serpentine, which is found over two-thirds of the island. Many of the pockets are large, but narrow with the depth. The cost of mining is considerable, and the transportation facilities to the sea coast are poor. It is not probable that the mines can compete successfully with the Canadian."[5]

Prospects of nickel mining in Ontario.

The rivalry of New Caledonia.

Whether the working of manganiferous iron ores on that island containing cobalt and nickel will or will not change the condition in its favor cannot yet be foreseen, but it is hardly probable. Nearness to market, abundance of ore, and a supply of competent free labor and facilities for quick transportation are advantages which the Sudbury district is likely to continue to possess over its New Caledonia rival for all time.

The Future of Nickel.

The future of the nickel industry depends on the distinctive utilities of the metal, on the quantity and cost at which it can be supplied to consumers, and in a less degree on the quality of appearance. Twenty years ago pure nickel was not known in the arts; up to that time it was nothing more than an alloy with other metals combined with it in the ores, from which at best it was only imperfectly separated; and it was not indeed until after the pure metal began to be produced—the first examples of which were shown by Joseph Wharton at the Philadelphia Exposition of 1876—that its most valuable uses began to be found out. Some of these will be mentioned here as evidence of the growth of the nickel trade, and as an indication of the lines upon which it is likely to develop.

Finding out valuable uses of the metal.

The experiments conducted four years ago by James Riley of the Glasgow Steel Works with alloys of nickel and steel made a profound impression when the results were published; and although this may not prove in time to be the most valuable or useful of all the applications of the metal, it is the one which at present most strongly arrests attention in America. The explanation of this fact is found in the tests which, during the last three years, have been carried on by the Navy Department of the United States to determine the sort of material for armor best suited for the battle ships under orders of construction by the Government of that country. Mr. Riley's paper, read at the May meeting of the Iron and Steel Institute in 1889, contained no more than a speculative suggestion of the application of nickel steel to the armor plating of ships, but Secretary Tracy of the United States Navy

Riley's experiments.

[5] Report on Mineral Industries in the United States at the eleventh Census, 1890, pp. 269-71.

Department regarded the promise held out as "too great to be ignored by a Government requiring 20,000 tons of armor for its new fleet." Accordingly he began a series of trials to prove the suitability of nickel steel for the purpose in view, and not only so but to settle the question of the best armor plate in relation to the best ordnance—the strongest defence to match the most powerful attack. The following extract from the Secretary's report for 1891 shows the progress of the trials up to the close of that year :

Armor plate trials in the United States.

ARMOR PLATE TRIALS IN THE UNITED STATES.

"The experiments made last year at Annapolis, described in the annual report for 1890, consisted of a test of the two principal foreign types of armor, the English compound plate and the French all steel plate, and an entirely new plate also made in France upon the special order of the department, of nickel steel. The result of the trial showed that the compound plate was decidedly inferior, and that as between nickel steel and all steel the former had distinct and positive advantages, the all steel plate being broken into four pieces, while the nickel plate remained absolutely uncracked.

Tracy.

Report of comparative tests in 1891.

"A series of tests made during the following spring and summer confirmed the conclusions formed at the Annapolis trial as to the superiority of nickel steel, and the department accordingly decided to adopt it, and made arrangements with the contractors looking to that end.

Nickel steel plate adopted by the Navy Department.

"It remained however to give a thorough trial to the first armor of domestic manufacture before beginning to place it upon the vessels, and for this purpose it was decided to order typical plates which should be made the subject of an experimental test. This trial was to ascertain two points: first, whether our domestic manufacturers could produce an armor that would stand competition with the material manufactured abroad; and, second, which of the various modes of treatment suggested would give the best results. In reference to the latter point the questions to be considered were the relative merits of rolling and forging in the manufacture, and the effect of a new method of treatment, named from its inventor the Harvey process, designed to harden the surface of the plate while retaining the toughness of its body.

Trial of home made plate.

Relative merits of rolled and forged plate.

"Of the six plates tried three were furnished by the Bethlehem Iron Co., and three by Carnegie, Phipps & Co.

"In these trials, which took place at Indian Head on October 31 and November 14, the plates were subjected to tests more severe than had been applied at any foreign Government trials. Four shots were fired at each plate from a 6-inch gun with an impact velocity of 2,075 feet per second, and an energy of 2,988 foot tons, using the Holtzer projectile of 100 pounds. One shot was then fired at the centre of each plate from an 8 inch gun, with an impact energy of 4,988 foot tons, using Firminy and Carpenter projectiles of 210 and 250 pounds weight respectively. The plates were placed normal to the line of fire.

"The results of the trial were in the highest degree satisfactory. Each of the six plates manufactured in this country was superior to the English compound plate, while the nickel harveyed plate and the high carbon nickel plate were superior to all the foreign plates of the Annapolis trial. They may therefore be pronounced in advance of the best armor hitherto manufactured in Europe.

The results.

"Further light was thrown upon the question of the relative merits of all steel and nickel steel armor, and any doubt which may have remained upon that subject was finally set at rest. Of the three plates made by Bethlehem, two were of nickel steel, one treated by the Harvey process, the other not, and the third was of all steel, harveyed. Both the nickel plates proved to be far superior to the all steel harveyed plate, notwithstanding the advantages which it may have derived from the special treatment; and both proved superior to the French all steel plate tried at Annapolis.

Superiority of the nickel plate demonstrated.

"A third nickel plate, manufactured by Carnegie under the rolling process, also showed a marked superiority over the all steel plate of this year, and both it and the corresponding Bethlehem plate manufactured under the hammer showed a capacity of resistance to perforation fully ten per cent. greater than that of the French all steel plate. In this respect the results furnished by the two American plates manufactured by the different processes (forging and rolling) proved to be remarkably uniform, the 6-inch shots that were fired at them differing in penetration but an inappreciable amount. Tracy. Equality of rolled and forged plates.

"The trial thus definitely establishes the fact that armor of excellent quality may be produced by the rolling process, and that forging by means of the hammer, the greatest source hitherto of expense in manufacture, is no longer to be regarded as an absolute necessity. The importance of this fact can hardly be over-estimated, for it raises a probability that within a year or two the armor-producing capacity of the United States may be quadrupled in case of necessity, and that if we had 10,000 tons to let and could give 18 months from date of contract to commence delivery, the cost of manufacture would be reduced from 25 to 33 per cent., while the work hitherto confined to two firms would be thrown open to a large number of competitors"[6] Lessons of the trial

In his report for 1892 Secretary Tracy reviews the steps which had been taken by his department for the development of armor, and after special reference to the trials at Indian Head in October and November, 1891, he goes on to say: Report of trials in 1892.

"As a result of this trial improved methods were introduced in the Harvey process and further tests were ordered of new plates. The first of these tests took place July 26, 1892, at Indian Head. The plate used was a 10½-inch plate of nickel steel made by the Bethlehem Iron Company, the plate having first been forged to 12½ inches and then harveyed, and finally reforged to its former dimensions. In the two previous trials the corner shots had been fired from the 6-inch gun, and the 8-inch had been used only upon the centre of the plate. In this trial the 8-inch was used for all of the shots. The result was that three of the projectiles were broken up upon the surface of the plate, while the two right hand shells penetrated to a depth of 13 inches. It was evident that there was a want of uniformity in the hardness of the surface and that some special cause must have softened the right hand side of the plate. Upon investigation it became apparent that this was due to the process of reforging, resulting in a lower temperature and consequently reduced carbonization upon this side of the plate. Notwithstanding the penetration of the two right hand shots, the result by which the plate had remained free from cracks after receiving five blows from 8-inch projectiles was an extraordinary confirmation of the expectations that had been formed as to the possibilities of nickel steel treated as described. Tracy. Improved methods in the Harvey process. A comparative failure due to imperfect forging.

"It remained for a final trial to demonstrate the wisdom of the steps which had been taken and to crown the efforts of nearly four years with the highest degree of success. A final trial crowns the efforts of four years with highest success.

"This trial took place at the proving ground of the Bethlehem Iron Company, July 30, 1892. The plate was of nickel steel, harveyed, of the same thickness (10½ inches) as that of the previous trial, but unlike its predecessor it had been forged to its final thickness before the Harvey process was applied. As in the previous trial the 8 inch gun was alone used. Five Holtzer forged steel shells, weighing 250 pounds each, with a striking velocity of 1,700 feet per second, and each with an energy of 5,000 tons to the square foot, were fired at the plate at a distance of 30 yards.

"Never before these trials had any armor plate in the world been subjected to such a test as was represented by these five blows of a total energy of 25,000-foot tons.

[6] Report of the Secretary of the Navy for the year 1891, pp. 11-13.

Tracy.

The projectiles smashed upon the surface of the plate.

"The result may be told in a word. All five of the projectiles were smashed upon the surface of the plate. The plate showed no signs of injury further than the opening of a slight temper crack four inches in length from one edge, and a wale less than one inch in thickness on the back of the plate opposite each point of impact. The striking ends of the projectiles appear to have been splashed on the face of the plate, filling the slight indentation made by the blow with new material which became welded to the substance of the plate itself and left it as before a flush surface. The remainder of the projectiles could only be found in the shape of innumerable scattered fragments.

A result never before equalled or approached.

"The result above described has never been equalled or even approached before by anyarmor plate, American or foreign. It has demonstrated that the United States, in the reconstruction of its new navy, which ten years ago had no existence even on paper, is enabled to place upon each and all of its armored vessel a material the like of which the world up to this time has not seen; and that while vast sums have been spent in plating the sides of foreign men-of-war with an inferior material, this country will employ for the purpose an armor which is not only far more efficient, but which represents unquestionably, having reference to the dimensions of plates thus far tested, the highest development of modern science, and a development reached by its own independent efforts."[7]

As early in the course of these trials as September, 1890, the Secretary of the Navy was so well convinced of the superiority of the nickel steel plate that he asked and obtained from Congress an appropriation of $1,000,000 for the purchase of nickel matte. At this time an apprehension existed in the minds of United States authorities that the world might not be able to produce enough nickel for their wants, and they feared that prices would take a bound upward. They accordingly purchased from the Canadian Copper Company 4,536 tons of matte, containing about 900 tons of nickel. "The terms of the contract provided that the material should be delivered on board cars at Sudbury, Ontario, for transportation to such points as might be designated. Deliveries were to begin within three days from the date of the contract, and final deliveries were to be made within one month thereafter. Provision was made by means of competent assayers for ascertaining the quantities of nickel and copper contained in the matte, and that no carload should be shipped in which there was less than an average of 15 per cent. of nickel."[8] The payments to the Canadian Copper Company for matte amounted to $321,321.86, while freight cost $31,134.88, duty on the copper contents $9,547.40, and refining by the Orford Copper Company (in part estimated) $97,582.30, making a total expenditure under the appropriation of $459,586.44. "Of the nickel oxide produced by the Orford Company, by whom the refining is done, we are now using 40 per cent., while 60 per cent. is sold in Europe. Our material, after the payment of all charges, including the price of the matte and of the subsequent reduction, costs us 24 cents a pound, while that of other consumers costs them at least 38 cents."[9]

A large purchase of Ontario nickel.

Nickel required for an ordinary war vessel.

But this is the cost of the oxide. The quantity of armor plate required for an ordinary war vessel such as the United States is constructing is about 3,200 tons, and as the contract with the makers calls for only 3½ per cent. of nickel in the plate, the quantity of nickel used for one vessel is only about 104 tons, or say 135 tons of nickel oxide. Obviously therefore there is a modest limit to the quantity of nickel required for the manufacture of armor plate for the United States Navy, unless the Government of that peaceful republic should seek to emulate the naval greatness of all the European powers, which is as improbable as that she should follow their example in the creation and maintenance of a standing army.

[7]Report of the Secretary of the Navy for the year 1892, pp. 17-19.

[8]Secretary's Report for 1892, p. 21. The first contract appears to have been for 536 tons, and the second, under date of June 15, 1891, for 4,000 tons.

[9]Secretary's Report for 1892, p. 21.

NICKEL STEEL FOR HEAVY ORDNANCE.

But there is some likelihood of nickel steel being used in the manufacture of heavy ordnance as well as for armor plate, and at the present time experiments are being conducted to test its suitability for that purpose. The following extract from a lecture delivered before the Franklin Institute of Philadelphia last January by Mr. W. H. Jaques, Ordnance Engineer, will show what is being attempted as well as what has been done in this direction : Experiments with nickel steel for great guns.

"The increasing use of nickel in steel suggests a few words concerning this element, particularly as it is about to make its debut in a large calibre service gun (a thirty-five calibre eight inch B. L. R.), the forgings for which have been made by the Bethlehem Iron Company. Jaques.

"In this connection it is most seriously to be regretted that circumstances of a discouraging character should have intervened to prevent Mr. Riley's continuing the excellent metallurgical work he so happily and ably commenced in connection with the alloys of nickel and steel, particularly since the publication of his lecture to the Iron and Steel Institute, May 4, 1889, so many of his views have been proved by further experience and practice. Confirmation of Riley's conclusions.

"Bethlehem's part in this work is so well known by the practical results she has obtained, the gun forgings and other products supplied, and the superior resistance of her armor, that I need make no detailed statement here of our accomplishments. Further, they have already been referred to by the chiefs of the Bureaus of Steam Engineering and Ordnance in their last annual reports.

"As you will no doubt recall, Riley, Dick and Packer commenced their experiments with samples of French crucible nickel steel, containing three per cent., five per cent. and twenty-five per cent. of nickel ; were subsequently assured by personal investigation that the desired products could be obtained with certainty, not only in the crucible, but with perfect control in the open hearth, and that nearly all the nickel would be found in the steel. Riley, in the lecture referred to, described the action of the steel in the mould, its appearance, value of scrap, and the care and temperatures required to work it. He made a sufficient number of tests to show the marked increase of tensile strength and elastic limit produced by certain increments of nickel without impairing the elongation or contraction of area to any noticeable extent. He pointed out the effects of a variation of the proportions of carbon and manganese with the same percentage of nickel, the point where the increment of nickel changed its hardening influence to one of softening ductilizing, its neutralizing effect upon carbon, the difficulties of machining, and crowned his report by giving due credit to the patentee, French steel makers, his assistants and the authorities.

"Together with other conclusions he said : 'I am glad to be able to state that before the region of extreme difficulty of machining is reached, we have qualities of nickel steel available which will be of the utmost value for a very large number of purposes.'

"Comparing ordinary steel with nickel steel, he adds : 'I think there will be no hesitation in deciding that there will be a very great advantage gained by the use of the latter—advantage either in reduction of scantling or in increased strength and ductility. In the very important matter of corrodibility, it is with the greatest satisfaction I can state that the steels rich in nickel are practicably non-corrodible, and that those poor in nickel are much better than other steels in this respect. Some samples of the richer nickel steels which have been lying exposed to the atmosphere for several weeks will show an untarnished fracture.'

"These experiments to test the non-corrodible qualities of the various percentages of nickel steel, it will be remembered, were made in connection with Abel's corrosive liquid and hydrochloric acid water.

"I have cited Riley's conclusions to show how accurately they have been verified by the results since obtained, which give abundant testimony of the care and faithfulness with which his experiments were made.

"Mr. Hall of Sheffield claims to have made the first nickel steel gun, which instrument is reported to have burst at the first round, the rupture being due to the absence of suitable transverse strength. Whether this was due to the poor steel, poor construction, or the presence of nickel, was not stated.

Krupp's comparative tests.

"Many other nickel steel guns have been experimented with, but Krupp's comparative tests of two three and a half inch field guns, one made of ordinary Krupp steel and the other of nickel steel, appear to be the first trials of much importance that have been given publicity.

"Each gun was loaded with shell containing 170 grammes of picric acid, the centre of the shell in each case being 300 millimetres from the muzzle.

"When the shells were exploded the crucible steel gun burst into many pieces, while the nickel steel gun remained entire, showing an increase of the bore of 7.4 millimetres at the site of the projectile, but no cracks any where.

"The trial was continued with another shell containing 180 grammes of picric acid. Its explosion caused an enlargement of 9 50 millimetres and a longitudinal crack 80 millimetres long. No particle of metal was detached from the gun."[10]

In connection with the foregoing extract from Lieutenant Jaques' lecture the following account from the London Iron of further experiments by Herr Krupp are worthy of notice (unless indeed it is only a different account of the same experiments):

"A new nickel steel, the secret of the manufacture of which has been secured by Herr Krupp of Essen, has been experimented with at Meppen. Two 3.4 inch shells, each containing 6 oz. of picric acid were placed, one in a

[10]Present Development of Heavy Ordnance in the United States, by W. H. Jaques, p.p. 25-27. Lieutenant Jaques (who has served 21 years in the U. S. Navy) is the author of a valuable essay on "The Establishment of Steel Gun Factories in the United States," published in the Proceedings of the United States Naval Institute in 1884 (pp. 527-909). It was largely upon his recommendations that the Government of the United States undertook to promote the manufacture of armor plate and ordnance at home instead of depending for supplies upon European makers, and when the Bethlehem Iron Company six years ago resolved to undertake the manufacture of guns, shafting and armor plates, the position of Ordnance Engineer was offered to Lt. Jaques. The object of the Company was, as stated by Mr. Jaques in an article descriptive of the works published in the Proceedings of the Naval Institute "to erect a plant long needed in the United States to make the country independent in the possession of the means of supplying the nation with the most powerful guns and of equipping her ships with the most efficient shafting and armor." To this end a number of new and large buildings have been erected on the Company's grounds along the Lehigh river, which have been furnished with the best of modern machinery, and new buildings are still going up which, when completed, will no doubt make the Bethlehem works the largest in America. Upon a visit to Bethlehem last October I was shown through the various departments by Mr. Jaques, and a note of the armor plate and ordnance branch of the works may be fittingly made here. Four Siemens open-hearth furnaces are employed in the production of nickel steel, two of which have a capacity of 40 tons each per day of twelve hours, one of 20 tons and one of 10 tons. The process of alloying the metals is claimed to be a company secret, and to give better results than is obtained elsewhere. During my visit the 20-ton and one of the 40-ton furnaces were tapped and run into a mould, casting an ingot of 60 tons nickel steel. This contained 3¼ per cent. nickel, which is the Government requirement for armor plate, or a total of very nearly two tons (1.95). For a portion of the time the Siemens furnaces are employed in making all steel, the ingots of which are compressed into cylindrical shape by hydraulic power. Two of these, still warm from the press, were lying on cars ready to be taken to the forging shop. They looked like two great saw-logs, being 4 feet 6 inches in diameter and 15 feet in length. The ingots are forged under powerful steam hammers into any required shape, some for armor plates, some for guns and gun casings, and some for shafts, cranks, etc. The armor plates are heated in low furnaces, forged flat, requiring frequent reheating before the process is completed, and afterwards shaped by hydraulic power and tooled by machinery. After being finished in this way they are fitted together on platforms so that when sent to the shipyards each piece is ready to be put into the place designed for it without further machining or shaping of any kind. The specifications are furnished by the Navy Department, and hardly any two plates of the same ship or of any two ships are alike. Many of the plates weigh 30 tons and upwards. The long guns are heated in an upright furnace, some of the forgings being 25 to 38 feet in length, and weighing 25 to 45 tons. They are forged under a steam hammer weighing 125 tons.

gun of ordinary Krupp steel, and the other in a gun of the new nickel steel, at a distance of 12 inches from the muzzle. Upon the shells being exploded, the muzzle of the gun of ordinary steel was blown into a number of pieces, but the only effect produced upon the nickel steel gun was a local enlargement of the bore to the extent of a quarter of an inch. In the next experiment a 3.7 inch shell, containing 6.3 oz. of picric acid, was burst in a nickel steel gun at a point 19.5 inches from the bottom of the bore. The results were an enlargement to the extent of one-third of an inch and a fissure of three inches in length. Trials of plates of this nickel steel have also been made and are stated to have given satisfaction."[11]

Material for the construction of shafts, cranks, etc.

It is not improbable therefore that nickel steel will soon be utilized in the making of heavy ordnance as well as armor plate; and the frequent accidents which have recently occurred in the breaking of shafts of the great ocean liners will doubtless suggest the manufacture of shafts, cranks and indeed all important parts of the machinery of passenger ships as well as battle ships of nickel steel.

Armor Plate in Europe.

Experiments in Great Britain.

We know much less of the purposes to which nickel steel is applied in Europe, for the reason that the Governments of that continent are much more secretive in the trials they are carrying on than is the Government of the United States. A year ago the British Secretary for the Admiralty informed Parliament that nickel steel had been experimented with largely, that extensive orders had been placed for nickel steel armor forming the secondary defence of battle ships now in course of construction, and that several are fitted with this kind of armor which has been proved sensibly superior to ordinary steel when used in thicknesses of three or four inches. But the officials of the British Admiralty have been much slower to acknowledge the superiority of nickel steel for armor plate purposes than were their brethren in the United States, although the first suggestion of the usefulness of the alloy for this purpose was made by James Riley. But the astonishing results obtained in the United States last year at Indian Head and at the Bethlehem proving grounds could not any longer be ignored, and on the 1st of November a test was made at Portsmouth on board the target vessel Nettle. Up to this date tests in Great Britain had been confined to all steel and compound armor plates manufactured by English makers: but in this instance the experiment possessed a two-fold novelty, the plate submitted to the ordeal being of a nature new to Europe and having been manufactured in accordance with an American patent. The London Engineer furnished this account of the trial:

A surprising test on board a target vessel.

"The plate was made of high carbon nickel steel harveyized, or harveyed, by carbonizing the face and hardening it with jets of water. We may state at once that we are not in a position to report trials of this class from independent observation. The series of trials on board the Nettle are carried out by Admiralty officers, and are in all respects trustworthy; but in the interest of makers who in various stages of these trials might submit plates of an entirely experimental character, no officer or other official is allowed to treat the results as public property. In point of fact they are regarded as confidential unless the manufacturers wish to publish them themselves. There is we think no reason to find fault with this system. Certainly manufacturers have been thereby encouraged to make experiments which they might otherwise shrink from attempting, and although doubtless the effect must be that the public hear only of successful results they hear of them on trustworthy authority, and a very fair idea is obtained of all such work as is sufficiently good to be admitted into the service; and this is what mainly concerns the public, and when the photographs officially taken are published little is left to be desired as to completeness of information.

The Engineer's account of the test.

[11] Iron, February 24th, 1893.

"The trial in question is an important one. Photographs of the best Harvey plates tested in America have been printed by us. We pointed out then that the shape taken by the remarkable result achieved was the holding together of the plate under the wedging strain of five 8-inch projectile heads, which penetrated to a considerable depth. In fact the hard face due to the Harvey process caused the projectiles to break, and though the heads had impressed energy enough on the plate to penetrate to a considerable depth the plate, as we suggested, probably thanks in a great measure to the nickel in its composition, held wonderfully well together. Tresidder's plate, which was naturally compared with it, performed a slightly different feat. It broke up 6-inch projectiles in its face with very insignificant penetration. Thus the projectiles were more completely defeated, but they were much smaller. The Tresidder plate, be it observed, was in consequence of the complete defeat of the projectiles not submitted to the wedging strain which fell on the Harvey plates, and there is no evidence as to how it would have behaved under it.

"Clearly the link required from Harvey's point of view was to show that the plate face was capable of defeating the lighter 6-inch projectiles with as little penetration as in the Tresidder plate. This was needed, for the last Harvey plate attacked by 6-inch shot had certainly allowed their points in two cases to penetrate deeply; one side of the plate was in fact softer than the other. There was an explanation for this, but no explanation is as good as a successful performance. The success at Portsmouth therefore is, we venture to think, just what we want at the present moment, and we are endeavoring to obtain permission to publish the photographs, which as yet we have not obtained.

"A competitive trial at Ochta, near St. Petersburg, is expected to take place shortly, when the Harvey, Tresidder, St. Chamond and Schneider plates will be tested in a strictly comparative way by 6-inch forged steel Holtzer projectiles, fired with about 2,000 feet velocity. The Nettle trials consisted of an attack of three 6-inch Holtzer and two Palliser chilled iron shot, striking at a velocity of about 1,976 feet per second. The Palliser projectiles are expected to break up as a matter of course with comparatively slight effect. It is only latterly that the Holtzer shot have been similarly defeated. In the present instance they have, we understand, broken into small fragments with but little penetration."[12]

Another account was published in Iron, and this paper, after citing the statements of the U. S. Secretary of the Navy and the Chief of the Bureau of Ordnance on the trials conducted under their direction, went on to say:

Iron's account of the test.

"However much these positive statements might be discounted, it was impossible for the British Admiralty, considering the official authority on which they were published, to discredit them entirely. It consequently determined to submit them to a practical test, and with this object in view it entered into negotiations with the agents of the Harvey Steel Company of New York. Eventually Messrs. Vickers & Co. of Sheffield were commissioned by the Government to manufacture a nickel steel plate and to treat it according to the Harvey process by which extraordinary hardness is communicated to the surface, together with a proportionate amount of toughness, so that the increased brittleness which commonly attends the hardening of steel is prevented. This was the plate that was tested on board the Nettle. The experiment was in no sense a manufacturer's, but an Admiralty test. It is the only trial of a harveyized plate which has yet taken place in Europe, for although a similar plate has been manufactured by the same makers for the Russian Government, it will not be fired at until next week.

[12] The Engineer, London (England), November 4, 1892.

"The trial, which was conducted by Captain Hugo Pearson of the Excellent, was witnessed by W. H. White, C.B., Director of Naval Construction, Admiral Colomb, General Geary, R.A., Captains Jenkins and McKechnie, of the Ordnance Committee, Colonel W. W. Barlow, late of Woolwich Arsenal, and other officials. The Harvey Steel Company was represented by Mr. Edwin W. Fox and Mr. Joseph H. Dickinson of New York, and the manufacturers by Messrs. Albert and Thomas Vickers. The plate measured 6 feet by 8 feet, with a thickness of 10½ inches. Its dimensions were consequently the same as those of other sample plates tested on board the Nettle, and though the representatives of the steel company expressed a wish that it might be attacked by a gun of larger calibre and greater ballistic properties than the one usually employed, the test for purposes of comparison was of the ordinary character consistent with Admiralty conditions. This consisted of discharging five rounds at the target from the six-inch breech loader. The charge was 48 lb. of E.X.E. powder, the weight of projectile 100 lb., and the muzzle velocity 1,975 feet per second. The rounds were fired in the following order: (1) Holtzer steel shell at bottom right-hand corner; (2) Holtzer at upper left-hand corner; (3) Palliser shell at upper right-hand corner; (4) Palliser at lower left-hand corner; (5) Holtzer in the centre.

"The result of the firing was an astonishing success, and completely verified the accuracy of the reports received from America with reference to the merits of the Harvey hardening process. Contrary to ordinary experience the Palliser projectiles appeared to do as much execution as the French shells, for although they splashed upon the plate on impact they made indents of about 1½ inch in depth. The Holtzers on the other hand appeared to weld their points into the target before bursting into a thousand incandescent fragments. Every one was completely pulverized. The most remarkable feature of the trial however was the fact that the plate withstood its punishment so well that not a single crack was produced—a quite unprecedented circumstance in armourplate experiments. Further trials with thinner plates are to be prosecuted at Portsmouth, and should these prove correspondingly invulnerable many of our obsolete armorclads might easily be brought up to date by superseding their thin iron protection by the new armor of equal thickness and weight, but of greatly superior impenetrability."[13]

The result an astonishing success.

It is not known what decision if any has been reached by the British Admiralty authorities with respect to future construction, following this trial of armor plate on the Nettle, but it is not likely that the value of the lesson will be wholly lost. The Engineer in commenting upon the First Lord of the Admiralty's memorandum on the naval estimates for 1893-4 says: "Doubtless advantage will be taken of the increased resisting power to penetration afforded by the harveyized nickel steel plates; and, as a diminished thickness of armor can now be carried, it will probably be distributed over a greater area. We have slowly but surely been emancipating ourselves from that curious predilection for a small patch of enormously thick armor, of which the Inflexible was the earliest example.[14]

Possible adoption of the harveyized plate by Great Britain.

It is not likely that a pre-eminently naval power like Great Britain, which is now expending over $70,000,000 a year to maintain a navy adequate to her requirements, and building battle ships at a cost of $3,000,000 to $4,000,000 each for those of the first rank, will long be content to use any other than the best of material. Nickel steel plate will cost more than all steel plate, perhaps much more: but it will in part make up the extra cost in greater

The cost of nickel steel plate.

[13]Iron, London (England), November 4, 1892.

[14]Engineer, March 10th, 1893, p. 211.

lightness and increased efficiency, and in the construction of battle ships efficiency is the point of first consideration. Referring to the cost of nickel steel armor plate to the United States Government the Engineering News of New York says:

"Prices obtained for armor plates by the Carnegie and Bethlehem steel companies, who are the only manufacturers in the country, may well excite the envy of steel-makers who hunt for customers for best structural steel at prices under $40 per ton. Bids were opened on February 5th at the Navy Department for about 7,000 tons of nickel steel armor plate. The prices bid by the two firms ranged from $520 to $885 per ton for the different sizes and kinds of plate specified. About $56 per ton extra is asked for treating the plates by the Harvey process. Making a very liberal estimate for the cost of manufacture, it looks as if the profits on this order alone ought to go a long way toward repaying both the companies for their original expenditure on their armor-making plant. It is of interest to notice also that at an average price of $600 per ton the armor for the new line battle ship Massachusetts will cost about $1,225,000. The total cost of the vessel was estimated at $3,020,000."

The total quantity of armor plate required in the construction of this ship is 2,042 tons, the nickel contents of which would be at 3¼ per cent. (if gross tons are meant) not quite 150,000 pounds. Assuming the price to be 50 cents per pound, the cost of nickel contents in the plate will not exceed $75,000 (or $46,750 at the cost of nickel oxide). Unless then the cost of making nickel steel is vastly greater than of other alloys the question of cost of nickel steel plate will not long stand in the way of its adoption by Governments which are persuaded of its superiority. Nor is it likely that the Carnegie and Bethlehem works will long continue to enjoy a monopoly of supplying this plate to the Government at $600 per ton.

Tests in Russia.

The tests conducted by the Russian officials at Ochta were made upon one French and two English steel plates and a Vickers-harveyed nickel steel plate, and in commenting upon this trial the London Engineer reports the latter "to have altogether beaten its competitors."[15]

Effect of a general adoption of nickel steel armor plate on the production of nickel.

With all this evidence to demonstrate the value of nickel as an alloy with steel in the construction of war ships, the chances would appear strongly to favor its being so used by the navy building powers. Yet the demand for the metal would not be enormously increased if all the navies were to be reconstructed with nickel steel for armor plate: it would not be necessary perhaps to more than double the present production.

Other Uses for Nickel.

Whence then is an increased demand for nickel likely to arise? What other purposes give greater promise of consumption than the making of armor plate and ordnance? A few of these may be indicated.

Material for boilers, engines and locomotives.

As an alloy of steel the greatest use of nickel may be found in the making of boilers, engines and locomotives and structural material generally, where it is of vast importance to combine lightness and strength. In a large Atlantic liner for instance the plates of the boilers are one and a half inches thick, and enormous force is required to bend and rivet them, in which operation the plate is likely to be weakened by fracture, the lines of which are not always visible. If made of nickel steel alloy the plate would require to be little more than half the thickness, and while the boiler would be more easily and securely made, it would be but one half the weight—a very important item where there are twelve or thirteen huge boilers in the hold of one

[15] The Engineer, March 24, 1893, p. 256.

ship. Its strength would be as great, and it would be less liable to corrode. It would cost a little more, but its life would be lengthened.[16]

In the making of parts of locomotives and steam engines, as well as in the manufacture of cranks and shafting, nickel steel has also decided advantages over all steel. A locomotive is worth perhaps $100 per ton, and where the cost is so largely made up of the wages for labor as it is in the case of a locomotive a small addition to the cost of raw material is of little consequence. Many parts of locomotives, such as axles, of which everybody is so much afraid, tires, framework, etc., could be made of not much more than half the present weight and just as strong.

Quiet use of the metal for various purposes

There is a considerable quantity of nickel being used now in Great Britain and the continental countries, but the trade is carried on quietly, and perhaps the only persons who could give information about it besides the manufacturers are the refiners, who generally know for what purposes their customers are using the metal. It is quite possible that locomotive tires are being made out of nickel steel in Germany, and doubtless a big trade will be done in that line. It seems likely that these German nickel steel tires are displacing the tires of English make, but if so it will not be long before Englishmen use the same material

British Government purchases for experimental objects.

The British Government has been using a large amount of nickel in one way and another, but chiefly in making experiments. A firm in Glasgow got an order eighteen months ago which took up 20 tons of nickel, and this would have been regarded as an unprecedented order ten years ago. But the British Government is conservative of new methods, and its officials must be well persuaded before advising a change from good to better.

Chief uses of the metal twelve years ago.

Twelve years ago, when the production of nickel was 1,000 tons and the selling price about $1.20 per pound, the chief if not only uses of the metal were for German silver, body for electroplating and for coinage. Its present uses include these, with the difference that coins are now being made of pure nickel instead of nickel alloy as formerly. The Austrian Government intends to adopt it for this purpose, and it is rumored that they have given the French nickel company an order for about 3,000,000 pounds. It is only a rumor, but those who profess to know say that the company has received the order, and that it is probably for a larger quantity, spread over five or six years. Twelve years ago this French company refined 300 tons a year; today it is refining about 4,000 tons, having got the bulk of the expansion. It has gone on steadily improving its processes, and a great factor in cheapening operations has been the increase of production. But of course many blunders

The French nickel company's enterprise.

[16]Mr. Ian Cameron, manager of the Dominion Mineral Company's works at Sudbury, informs me that it was through smelting New Caledonia ore, which is free from sulphur, that the first nickel steel was made. "Garnier had a high furnace similar to an iron blast furnace, and he put his nickel ore through that furnace and smelted it as if it was iron ore. Every particle practically of the iron and nickel in the ore was got out—though there was a pretty heavy loss of nickel and iron in the slag—and the result was a very good ferro nickel, which led to the making of nickel steel by Mr. Macbean, then one of the Directors of Le Nickel, who started the Ferro-nickel Company in France, at or near the German frontier. This company induced the Steel Company of Scotland to experiment with nickel steel, and Mr. Riley, the manager, told me that if it had not been for his company stopping him they would now be making all the boiler plate in Scotland of nickel steel. But the trade got brisk, and the company had enough to do without experimenting."

In a recent communication Mons. Jules Garnier, the French metallurgist who has been prominently connected with the development of the nickel industry, gives the results of a number of tests made in September, 1892, at the Cleveland Rolling Mill Company's works, to determine the relative quality of steel with and without the addition of nickel. The two steels differed only in the amount of nickel added to one of them, the quantity being about 3 per cent. The method of manufacture and the charges of both heats were absolutely identical. The ingots for both heats were rolled into boiler plates under ordinary conditions. The tests show the following general results: (1) Nickel steel has on an average a higher limit of elasticity of 11,400 lb. per square inch, or nearly 31 per cent. (2) Nickel steel has an ultimate tensile strength greater by 10,400 lb. per square inch, or an increase of about 20 per cent. (3) The ductility is not reduced by the presence of nickel. The nickel used was made from Sudbury ores at the Brooklyn Nickel Works, near Cleveland, a refinery built according to the plans of Mons. Garnier.

have been made. That is inevitable in dealing with any new enterprise of this kind, the details of which must be mastered experimentally. The producer of pig iron, copper, gold or any other of the staple metals, can usually sell his metal as fast as it is produced to some person or other. If the price is made a little less than market rates, some one will take it; but the man who produces refined nickel must hunt up his own customers, and they are few in number. The demand today is not so great as the supply, but so soon as the metal is produced at 35 or 36 cents per pound instead of 42 the consumption may be expected to grow rapidly. And no doubt it is possible to sell nickel at these prices if the requirements of the market would justify operations on a larger scale than appears to be prudent to enter upon now. A thoroughly practical man says: "I can lay my hand on a mine tomorrow that would show a splendid result at these figures, but it is not every mine that can do so."[17]

Lower price will give an impetus to demand.

Several years ago Mr. Wharton of Philadelphia, as already mentioned, began the plating of material by rolling refined nickel into thin plates and then pressing or welding it on both sides of a sheet of iron or steel; but he does not appear to have developed this application of the metal into a regular business. The process gives a very good article, but it is a little troublesome. A slab of nickel and a slab of steel may be rolled together so as to show a steel face upon one side and a face of nickel upon the other; or nickel may be rolled upon both sides of the steel, and when planished it presents a very attractive appearance But results almost equally good as regards appearance may be obtained by dipping or electroplating, and the rolling process has not therefore come into general use.

Rolled nickel for plating or welding.

At the present time the most promising uses of nickel are for the manufacture of body for electroplating, and the making of white metal alloy which does not require electroplating. If 25 or 28 per cent. of nickel is added to a white metal alloy the material is nearly as good as silver plate, and it can be kept clean with infinitely less trouble, besides being of uniform color and quality throughout the whole of its substance. A cheap electroplated article will cost as much as or more than a solid white metal one, and after the coating has worn it is an unsightly thing of patchy yellow. Door fittings if made of white metal would cost perhaps 10 per cent. more than brass; but they would always be bright and clean, and easily kept so. A gas bracket weighing 10 pounds, if made of white metal instead of brass, would consist of $2\frac{1}{2}$ pounds of nickel and $7\frac{1}{2}$ pounds of brass, the former costing

Body for electroplate and white metal alloy.

Uses of white metal.

[17]The New York Engineering and Mining Journal of May 13th, 1893, says: "One thing definite may be said, we think, about nickel. The decline in its price which has taken place during the last two years will be maintained, and in all likelihood it will go still lower. There has been recently an industrial revolution in this metal equal in importance to that which followed the opening of the mines in New Caledonia. The discovery of the Sudbury deposits, and the Orford process by which nickel-copper matte can be cheaply and successfully treated, have made America independent of the world for its supply of nickel, and it now threatens the European markets, the cost of production having been brought below that of the metal of New Caledonia. European metallurgists have not been standing still however, for an improved process, the invention of M. D. Levat, formerly director-general of the Société le Nickel, has already been put in operation at Havre, France. This is a dry process; indeed, it may be said that the day of wet processes for nickel-winning is past."

The Engineer of London, Eng., of January 6th, 1893, also says: "The remarkable discovery of the volatility of nickel in carbonic oxide, due to Mr. Ludwig Mond, is according to a statement of the discoverer to be utilized upon a commercial scale, but it is not known whether the works have as yet been started. The older processes of obtaining the nickel have been improved by the adoption of continuous reduction furnaces, instead of crucibles, and in other details without much alteration of principle, and particular attention has been paid to the production of ferriferous metal for steel makers by Mr. J. Garnier and others; the modern practice of nickel smelting so far as it can be made public having been treated in considerable detail by M. Levat. In consequence of the large supplies coming from Canada and New Caledonia, the price of the metal has continually declined in spite of the new demand in Europe for military purposes, about 500 tons per annum being now required for the bullet casings in the new small arms ammunition. The alloy, one of nickel to four of copper, used for this purpose seems to possess many valuable properties, and it has been suggested as a substitute for copper in locomotive fire-box plates."

$1.05 and the latter 75 cents, or $1.80 in all. There is perhaps $10 worth of labor on it; so that the increased cost through putting 25 per cent. of nickel into it would be only a fraction of the total cost, while a handsomer article and one more easily kept clean would be the result. Hotel bath and lavatory fittings, etc., are now being made of white metal, and one manufacturer in the old country is said to turn out $1,000,000 worth in a year. "There is a large trade growing up," a gentleman engaged in the production of nickel informs me, "in the displacing of brass for lamps, chandeliers, electroliers, door and railway carriage fittings, etc. White metal for these purposes is largely taking the place of brass. It is dearer, but it is ever so much brighter, prettier and easier to keep clean; it tarnishes very little and a light rub will restore its planished appearance, whereas brass requires continuous labor to keep it bright. I have seen a butcher's shop in the old country the walls of which were wholly lined with white tiles, and all the fittings, brackets, hooks and nails were of white metal. The effect as seen by gas light from the street was very fine, and it really enabled the butcher to add a little to the price of his beef. The white metal trade is the one we prefer."

Another use found for the metal in Europe is in the making of bullet casings for small arms ammunition. For this object an alloy of one part nickel and four parts copper has been adopted, and factories producing ammunition for military small arms are requiring now 500 tons of nickel annually in the manufacture of bullet casings alone. Bullet casings of nickel-copper.

No little misapprehension however prevails as to the demand for nickel. There are some who declare that there is no limit to the quantity which the markets are capable of absorbing, and that some cause of policy, or want of capital, or lack of enterprise is blocking the wheels of progress in the Sudbury mining district. If Sudbury was in the United States, we are sometimes told, the woods would be alive with prospectors, mining camps and smelting works; millions of capital would be invested there, millions of tons of ore would be raised and treated annually, refining works would be established, and Sudbury would supply the world with the pure metal. Such is the language of dreamers, and men who have mining locations to sell. But men who know the trade do not speak in that way; neither do men who have a knowledge of how industries grow. On this subject I have obtained a short statement from Mr. Ian Cameron, manager of the Dominion Mineral Company's works, and a man of large experience in nickel: Misapprehension regarding the demand for nickel.

"The break in price which took place eight or nine years ago, when nickel fell from 2s. 6d. per pound to 2s," Mr. Cameron says, "led to such an increase in the demand that we could not supply it. When I built the old smelting works for the French company at Kirkintilloch in Scotland I completed one furnace and was then instructed to put up other two. I actually erected five, and with twelve the company could not until the slackness of a few months ago overtake the work. The furnaces are small, and together they run about 4,500 tons per month. The ore is peculiar; it contains about 8 per cent. of nickel and does not lend itself to treatment in large quantity. If it could be as easily fluxed as the Sudbury ore the furnaces could run through an enormous quantity. I think the supply of nickel is greater than the demand, and that this is the reason there is no greater expansion of the industry in this country or in New Caledonia. The demand is not by any means unlimited; we have got to make our trade as we go along." Responsiveness of consumption to a drop in price. The present supply greater than the demand.

Of course if there was an active and fast growing demand for nickel, miners and metallurgists would be found ready to supply it; and owing to the position of the mines in this Province and the great extent of the deposits capitalists would easily be persuaded to invest money for mining and treating the ore if there was a sure prospect for unlimited sale of the product and of large profits being realized. There is no hindrance to investment in Ontario, and in the matter of large workable bodies of nickel ore this Province as far as

No hindrance to investment in Ontario.

yet known possesses a monopoly of it on this continent. There are draw backs, but they are not insurmountable. As regards two or three of these I quote again from Mr. Cameron :

Some draw-backs to be overcome.

"The supply of nickel in the Sudbury district is unlimited, and there are a great many properties which have not been opened up. The New Caledonia ore, some of which occurs as a silicate and some as an oxide, averages as taken out of the mines from 5 to 6 per cent. of the nickel. I have got ore from there testing 25, 35 and 40 per cent. of nickel. This ore cannot be washed ; it can only be cobbed or picked. The native laborers are set to cob it ; they are good enough for that, and men, women and children may be employed at this work at a very low rate of wages. One trouble in this country is the dearness of labor, which costs as much as fifty per cent. of our whole expenditure. The duties upon stuff we buy also run up to a high percentage ; for example, the duty on coke amounts to 8 or 10 cents per ton of ore. The net value of $3\frac{1}{2}$ per cent. ore after paying all costs at present selling price cannot be more than $1 per ton, the royalty on which at 3 per cent. would be three cents per ton. The duty on coke therefore is three times as much as all that would be paid to the Government for royalty."

New Caledonia ore and its preparatory treatment.

Cost of labor in Ontario.

Duty on coke.

Royalty.

As regards refining, Mr. Cameron says :

"I do not know that it would be a very great advantage to have the refining of nickel done in this country. According to present practices acids are required, and these cannot be bought as cheaply here as on the other side of the Atlantic, and there are other things that we would have to import. Another disadvantage is that freight charges on refined nickel going to Europe would be greater than on matte. The rate on 100 tons of matte containing 50 per cent. of nickel would be $6 or $7 per ton ; but owing to risk of carriage 50 tons of refined nickel would not be carried at $12 per ton. I do not think there is much hope of refining nickel in this country until the consumption here has greatly increased, or until chemicals and other necessaries in refining can be bought as cheaply as in England or France, or until a successful dry process has been introduced. We could not refine here according to present practices and under existing conditions and hope to sell the nickel in Europe, as there is a heavy duty on the fine metal in France and Germany as well as in the United States. There is of course none in Great Britain."

Refining.

No cause for discouragement.

In the present state of the nickel industry there is no well-founded cause for discouragement, except perhaps in the minds of extreme optimists with locations of unknown value on their hands to sell. Remembering that it is a comparatively new metal, and that until a few years ago its ore was scarce and hard to treat, the rank to which it has already attained is calculated to excite a feeling of wonder. The progress of operations in this Province in view of every circumstance, and especially of the fact that the largest refining concern in the world is also chief owner of the only mining properties which can compare in richness and extent with those of Ontario, has certainly been as active as the state of the market for the metal would seem to justify. Mining and smelting the ores had their beginning here less than seven years ago, yet measured by the number of men employed, the amount of wages paid for labor and the value of product last year there are only six iron working industries of the Province, as shown by the census of 1881, which exceed this one ; and among those are such old and stable industries as agricultural implements, blacksmithing, and foundry and machine shops. Of iron mines there is not one that is worked, although we have iron ores in great abundance ; neither is there one blast furnace to smelt iron ore, although we consume in the Province upwards of 300,000 tons of pig iron every year. All the indications point to a steady increase in the consumption of nickel ; and the number and variety of new and valuable uses which are being found for it give assurance that the industry is firmly rooted and will grow.

Progress of the industry in Ontario.

VIII.

THE METALLURGY OF NICKEL.[1]

By Mons. David Levat.

Garnierite, the nickel ore of New Caledonia.

Nickel is found in New Caledonia in a single mineral, Garnierite or Noumeite, a hydrated silicate of nickel and magnesium, of a bright apple-green color when pure, which is deposited in concretionary masses or cratings, in the fissures of a serpentine rock. This silicate is not a product of secondary decomposition, no traces of sulphides or arsenides of the metal having been found even in the deepest workings, and the mode of occurrence indicates clearly that the mineral has been deposited by water in the form in which it is now found. In a collection of specimens brought to Paris by Mons. Peletard, an engineer who has lately published a geological map of the island, impressions of insects have been found which are referred to living forms. The distribution of the mineral through the serpentine matrix is not an arbitrary one, it being always found at or near the contact of the rock with the red clays, filling basins or cavities in the rock, but never in the clay itself. These masses of clay are products of the decomposition of the serpentine, and contain all its constituents, in addition to manganese, cobalt and chromium. The thermal springs that have given rise to these clays follow lines of fissure having a general northeast and southwest direction. These clay deposits, which are often covered by considerable deposits of oolitic brown iron ore, contain irregularly stratified masses of cobaltic manganese ore, with 2.5 to 3.0 per cent. of cobalt and chromic iron ore, a granular or so-called alluvial form, which latter mineral is also found in veins in the solid serpentine.

Occurrence and mining of the ore.

The nickel ore, which is newer in origin than those of manganese and cobalt, is found as a vein matter in hollows resulting from the shrinking of the red clay from the sides of the rock-funnel enclosing it. These veins vary very much in size, the maximum breadth being about eight metres; but in some cases the whole of the rock is filled with small veins of mineral, so that it may be worked as a whole up to a thickness of 250 feet. Only the larger veins in the hard rock can be worked by systematic mining, as the walls are very irregular and may easily be lost in driving levels; by far the larger number of the workings are in open cast, at altitudes varying from 300 to 600 metres above the sea level, where it is easier to follow the richer developments, and with a comparatively small preliminary outlay to make provision for some years of quarry working in the same locality. The preliminary working is mainly in the direction of removing the red clay, which can only be imperfectly separated from the ore by washing; and the iron ore it contains, if left behind, impoverishes the yield of nickel, besides being objectionable in the smelting by reason of its adding alumina to the charge, which is sufficiently refractory from silica. These works are often a source of considerable expense on account of the falls caused by the heavy spring and autumn rains and the difficulty of obtaining sufficient labor.

Classes of labor employed at the mines.

As regards the latter point, apart from free white men, who are mainly employed as artisans or sub-managers, at the Australian rate of wages of 12s. to 16s. per day, four different sources of labor are employed, namely, assigned convicts, those on restricted leave, natives and New Hebrideans of the Kanaka race, and Chinese, Annamites and Tonkinese. The first two classes are very

[1]This is an extract from a long general memoir on the production and uses of nickel and its alloys, which appeared in the Annales des Mines, Paris, 1892, published by authority of the Minister of Public Works. M. Levat is a civil and mining engineer, and was formerly director-general of the Société le Nickel.

unsatisfactory, and the Kanakas, although of value for transport and lighterage service, are unfit for mining purposes, being unable to stand exposure to the mountain air, and as a rule the tribes object to working about their own homes, so that the work is principally done by immigrants from the New Hebrides; while the labor in the coffee plantations of the latter islands is largely furnished by New Caledonians. The Chinese are valuable workmen, but the supply from China proper, owing to political and diplomatic complications, has of late years been completely stopped; but latterly natives under contract have been brought from Tonquin, and the result appears to be satisfactory, their work, costing about 2s. 9d. per day, being better than that of convicts at nearly double the price.

Dressing the ore.

The mineral is carefully sorted by hand at the quarries and divided into rich and poor qualities, the former containing 8 per cent. and above of nickel, and the latter all below that limit. As the hill-side workings are entirely without water, dressing operations can only be carried on in the lower ground. These are confined to simply washing away the red clay, and even this preparation cannot be carried too far without risking considerable loss (up to 3 or 4 per cent.) in the mud washed away. Hence the necessity of carefully clearing away the waste before working the mineral. The quarry waste, containing 3 to 4 per cent. of nickel, is not utilized.

Transportation from mine to shipboard.

The conveyance of the mineral from the mines to the coast is done principally by ropeways, which are mostly of the simplest construction. When the produce is not more than 7 or 8 tons daily, the selected ore is pla cedin sacks holding from 100 lb. to 120 lb. attached to a hardwood carrier, which is placed on the rope and allowed to slide down, for which purpose a slope of at least 18 degrees is necessary, the empty sacks being carried back by hand or mules, together with the carriers, which make 15 or 20 journeys before they are worn out. The spans of the rope range from 500 metres to 600 metres, and in some instances 800 metres. From the lower stations the carriage to the shore is effected in carts or by railway, but these distances are never very considerable, as only the mines within a zone of a few miles from the coast are actually worked. The embarkation is done in lighters carrying 12 tons to 15 tons each, the cargoes being sent direct to Europe, or by transhipment at Noumea and Sydney. During the wool-shipping season steamers and sailing vessels carry ore and regulus at nominal freights as ballast. The direct shipment in large sailing vessels is less feasible, owing to the numerous accidents that have happened in navigating the reefs forming the coast, and the harbor of Noumea being the only one lighted, the other ports can only be approached in daylight and with a fair wind.

Conduct of mining operations.

Mining operations are conducted either by companies with sufficient capital to provide complete means of transportation, or by single miners who work on their own account on exposures which offer facilities for immediate labor and who deliver the ore on specified conditions. The price at which the ores are sold on the spot naturally varies with the market value of nickel and with their contents, rising rapidly as the latter increases, being better able the richer it is to bear the many charges which the ore must sustain before being smelted and refined. Advances in provisions and goods are generally made to isolated miners or small associations of miners, and also even advances of money, which they reimburse by delivery of the ore, so that any active miner in New Caledonia may work with success, even without capital.

Mining rights.

The acquisition of mining property is easy and open to all, thanks to the special mining regulations established in the colony by decree of the governor dated 13th September, 1873. They follow principally the mining laws of Australia, which give an absolute right to obtain any lodes discovered, but have been modified by the decree of 22nd July, 1883, which has remodelled entirely the mining legislation of the colony and constitutes the unique law at present in force.

Treatment of Garnierite.

The treatment of the mineral has undergone several modifications before arriving at the present practice. The original plan of Mons. Garnier was to treat it like iron ore by running it into pig metal, which was afterwards to be refined in a reverberatory furnace to ferro-nickel. For this purpose two blast furnaces were built at Noumea, and a refinery with two Siemens furnaces at Septemes, near Marseilles. Only the first part of the process gave satisfactory results, nickel-iron pig metal having been obtained from the richer lumps, ores averaging 9 to 10 per cent. of nickel of the following composition: Nickel, 65 to 68; iron, 29.5 to 23.0; sulphur, 1.5 to 2.5; silica and carbon, 3.5 to 5.0; and other matters 1.5 to 2.5 per cent. But it was found to be impossible to refine this in the reverberatory furnace owing to the presence of sulphur, which has an extremely high affinity for nickel. It was therefore necessary to revert to the old method of concentrating the metal as sulphide by the addition of pyrites or sulphur. The average composition of the ore available for smelting was: Silica, 45 to 50; iron, 16 to 14; nickel, 8 to 7; magnesia, 12 to10; alumina, 3 to 5; water and oxygen, 16 to 14 per cent. This requires from 25 per cent. to 30 per cent. of bases (oxide of iron or limestone), besides a sulphurizing material. As neither gypsum nor pyrites, free from arsenic and copper, were available for the latter purpose, the charge for the blast furnace was made up as follows: ore, 1000; coral, 300; sulphur, 35; small coal or coke 75 kilogrammes. The greater part of the sulphur passed into the regulus, and a fluid slag was obtained with 48 per cent. of silica, 12 to 13 per cent. of iron, and not more than 0.40 to 0.45 per cent. of nickel; but the local smelting was given up owing to the difficulties in procuring coke, and now the ores are for the most part smelted in England, alkali waste being used as flux.

Garnier's early method.

Local smelting abandoned, and the ore shipped to England.

The consumption of coke is about 20 per cent. of the weight of the charge, or about 30 per cent. of that of the ore treated. Small-sized water-jacket cupolas, smelting from 25 to 30 tons in twenty-four hours, are used. The product contains nickel 50 to 55, iron 25 to 30, and sulphur 16 to 18 per cent., the latter being necessary to make the regulus sufficiently brittle to be easily powdered. The subsequent concentration may be done either in the reverberatory furnace or the Bessemer converter. In the former two calcinations, followed by fusion with quartz sand, are necessary for the removal of the iron. The furnace treats two tons in 24 hours, with the consumption of an equal weight of coal. The operation, which lasts eight hours, is controlled by sampling during the progress, and is stopped when the iron has completely disappeared in order to prevent loss of nickel in the slags, which however are not thrown away, but are returned to the ore-furnace, as they form an excellent flux, besides containing $2\frac{1}{2}$ per cent. of nickel. By the first concentration the iron is reduced to 2.5 to 3 per cent., and by the second to 0.5 to 0 75 per cent., the sulphur being kept to 16 per cent. at least. In the Bessemer converter the concentration is more rapidly done; a charge of one ton of regulus melted in a cupola is introduced into the converter and blown with air at a pressure of about forty centimetres of mercury. The temperature rises from the combustion of the sulphur, and sand is added to flux the iron. If the proportion of the latter metal does not exceed 36 per cent. it may be completely removed in about one hour and twenty minutes, but with a larger quantity the bath should be skimmed after blowing for twenty-five minntes and fresh flux added, as the fining will be imperfectly done if too large a quantity of slag is retained in the converter. When the slags begin to show signs of containing nickel-oxide the refined metal is poured into moulds. Arsenic, antimony and silver are removed either in the slags or by the blast; cobalt remains with the nickel-sulphide. The converter slags are much richer than those of the reverberatory furnace, containing from 14 to 15 per cent. of nickel, mostly as shots of diffused regulus, which may in part be collected by

Furnace treatment, and subsequent concentration to eliminate iron and sulphur.

running the slag into conical pots and separating the cake of metal at the bottom. The whole of it must in any case be returned to the ore furnace. Attempts have been made to continue the blowing up to the complete removal of the sulphur to produce a material that would only require a final reducing treatment to obtain pure nickel. This has however been found to be impossible, owing to the high affinity of nickel for sulphur, the heat developed in such an after blow being less than sufficient to counteract the cooling effect of the air, and as the product when free from copper has a high melting-point, approximating to that of iron, it sets very rapidly, and blocks up the tuyeres.

Refining the regulus.

The refined regulus, whether obtained from the reverberatory furnace or the converter, consists essentially of nickel-sulphide (or nickel and copper sulphides, if obtained from pyritic ore like that of Canada), with not more than 0 50 per cent. of iron and the same proportion of other foreign matters. It is crushed to pass a 65-mesh sieve, and charged in quantities of 600 kilogrammes upon the bed of a reverberatory calciner 10 metres long and 2 50 metres broad, with four working doors on one side, forming a layer about two inches thick, which is constantly rabbled and moved gradually from the flue of the fire-bridge end. The operation lasts eight hours with pure nickel-sulphide, and only six when the regulus contains copper. The consumption of coal is 2,000 kilogrammes for 2,400 kilogrammes of material roasted. The temperature is kept to a dull redness, except towards the end, when the furnace is raised to a bright red heat. The finished product, which should not contain more than 1 per cent. of sulphur, is ground to pass a sieve of 120 mesh, and subjected to dead roasting in a furnace of the same breadth as the preceding one, but with a shorter bed. The charge is 500 kilogrammes renewed every six hours, and the temperature is kept at bright redness; three tons of coal are burnt in 24 hours. The product is nickel oxide, or nickel and copper oxides, and should not contain more than 0.40 per cent. of sulphur.

Reduction of nickel oxide.

The reduction of the oxide is effected by mixing it to a paste with flour or other organic matters, dividing into small pieces when dried, and strongly heating with charcoal powder. Formerly the paste was cut into cubes of 12 to 15 millimetres, but in France disks of regular shape, 50 millimetres in diameter and about 15 millimetres thick, made in a press, are preferred. They must not be made thicker, or the reduction will be imperfect in the centre. The Chinese, who are somewhat considerable consumers of nickel, prefer to have it moulded into ingots similar to those used as money in China. Formerly the reduction was effected in crucibles holding 50 to 60 kilogrammes in a gallery or reverberatory furnace, but owing to the imperfect and irregular heating the process was very wasteful of fuel, and the pots did not last for more than five or six operations. This method has therefore been abandoned in favor of furnaces working continuously. The first of these is a large muffle 3.5 metres long and 1.8 metres broad, heated by the flame of a gas furnace, which is passed several times around it by a series of spiral flues. The shorter sides are closed by balanced doors, and the iron pots containing a mixture of oxide and charcoal are subjected to a gradually increasing heat for 24 hours, being entered at the coolest side and pushed gradually nearer to the fireplace. This with mixed oxides gives a coherent product; but pure nickel oxide, although it is reduced by carbon at a comparatively low temperature, must be subjected to a temperature of 1,100° or 1,200° for four hours to obtain the coherent metallic character required by the customer; and as such a heat is unattainable in the muffle, the operation must be finished in a crucible.

An improved plan.

Another and more improved plan of reduction is in a regenerative furnace resembling that used for reducing zinc oxide in Belgium, but having retorts open at each end. The mixture of oxide and charcoal is charged by a semi-circular scoop at one end, and when finished the charge is pushed out at the other end into closed receivers, where it is allowed to cool out of contact with

the air. A furnace with 22 retorts is capable of reducing 1,500 kilogrammes of nickel oxide or 3,000 kilogrammes of nickel-copper oxides in 24 hours, the charge of 750 or 800 kilogrammes requiring ten hours in the furnace in the first and five hours in the second case. About two tons of coal are required for heating in the twenty-four hours, and the work is done by two men per shift of 12 hours. The reduced metal is sifted to separate the cubes or disks from irregular and broken masses, which are afterwards collected by a magnet. The former are polished by friction upon each other in a rapidly rotating barrel, while the latter is added in packing the barrels to make up the exact weight of 100 kilogrammes

Among the more important recent applications of nickel is that of the alloy (nickel 20 parts, copper 80 parts) for the casing of bullets for the small-bore rifles adopted in modern armaments. This combines a higher tenacity than that of the best brass with a high co-efficient of elongation, the former being from 28 to 31 kilogrammes per square millimetre, and the latter 25 to 35 per cent. and exceptionally as much as 39 per cent. in the metal as cast. The co-efficient of elongation increases with the freedom of the alloy from iron. By rolling cold the tensile strength is increased to 60 or 62 kilogrammes and the elongation is diminished to 3 or 4 per cent. When annealed under the most favorable conditions the strength is 30 to 40 kilogrammes and the elongation 32 to 39 per cent., compared with copper, where the corresponding figures are 25.1 kilogrammes and 34.1 per cent. The annealing of this alloy is a very delicate operation, requiring special manipulation, the details of which are mostly kept secret by the manufacturers. The principal object is to avoid oxidation, and this according to the author may be most effectually done by separating the sheets in the annealing piles by sheets of cardboard, which are carbonized during the process. If badly annealed, the mechanical properties are altered in a remarkable manner, the burnt metal having a tensile strength of 30 kilogrammes, with only 1 per cent. elongation. In a general way the annealing is considered to be bad if the tensile strength is below 33 kilogrammes and the elongation less than 30 per cent. The elastic limit is from 11 to 15 kilogrammes when well annealed and 45 kilogrammes when the metal is hard from the rolls. The ready malleability of this alloy seems to render is particularly suitable for locomotive fire boxes, and plates for this purpose were exhibited by the Societe des Metaux at the last Paris Exhibition. Nickel-copper alloy.

M. Levat also treats of the nickel deposits of the Sudbury district, recounting various facts in connection with the geological formations in which they are found, their manner of occurrence, etc. As to the mining operations there he says :

Treatment of Sudbury Ores.

The working of the Sudbury deposits is concentrated in the hands of several companies possessed of ample means and improved appliances. Only those mines close to the railway are at present worked, but there are many analogous deposits still unknown, unworked or insufficiently developed, owing largely to the difficult nature of the country. Nevertheless, according to an official report addressed to the Secretary of the United States Navy in October, 1890, there had been exposed at that time in the various workings a mass of ore calculated to contain not less than 650,000,000 of tons, the total quantity raised up to that time for a period of two years only being about 160,000 tons. These figures sufficiently indicate the economic and industrial importance of Canada as a producer of nickel. The average contents of the ore do not exceed 3 to 4 per cent. of nickel and about the same of copper. The ores of the Canadian Copper Company appear relatively less rich in nickel than those of the Dominion Mineral Company, but both seem to increase in contents of the useful metals in proportion to the depth of the workings. Extent of the deposits.

Smelting the ore.

. . The smelting of the roasted ore is the most interesting part of the local treatment of the Canadian mineral. It is done in large water-jackets with steel plating of 3 millimetres and of elliptical form, made in one piece from the hearth to the charging door. The hearth itself is closed by a plate of iron covered with fire-clay. Furnace No. 1 of the Canadian Copper Company smelted in 259 consecutive days 31,268 tons of ore, an average of 120 tons every 24 hours. No. 2 ran for 73 days, smelting 9,740 tons, or 133 tons every 24 hours. The low height of the furnace avoids the reduction of the iron and the formation of "wolves." The coke consumed during the campaign above mentioned was 5,107 tons, which smelted 41,000 tons of ore, an average of 12.5 lb. of coke to 100 lb. of ore. The coke, which contains 10 per cent. of ash, comes from Pittsburgh by lake and rail, and costs delivered at the smelters 35 francs per ton. The matte produced in the same time amounted to 5,059 tons, about 12 per cent. in weight of the ore smelted, almost exactly the same proportion as that of the coke used. In other words, 1 ton of matte requires for its smelting 1 ton of coke. The slag is very basic, as the following analysis will show :

Matte and slag.

SiO_2	38.00 per cent.
FeO	43.00
CaO	4.50
Al_2O_3	10 00
S	2.00
Ni	.45
Cu	.40
MgO	2.50
	100.85

At first the mattes contained more copper than nickel, which proved disadvantageous in their subsequent treatment, the refiners charging more as the proportion of the copper exceeded that of the nickel. In 1889 the mattes contained, according to the analyses of the Canadian Copper Company,

Cu	26.910 per cent.
Ni	14.140
Fe	31.235
S	26.950
Co	.235
Slag	.935
	100.405

By selecting out the purely copper ores for separate treatment the nickel contents of the matte have been increased. In February, 1891, the mattes contained

Cu	16.94	16.95	17.84
Ni	19.40	21.47	23.45

The charge in the Dominion Mineral Company's furnace is composed partly of purely nickeliferous ores produced by certain of its mines. That company's mattes contain

Cu	18 to 20 per cent.
Ni	24 to 26

Relation of cost of production to price of fine metal.

The cost of smelting at Sudbury may be estimated at between 8 and 9 francs per ton of ore. Manual labor comprises only about 2.25 to 2.50 francs per ton of this cost, notwithstanding its dearness. The workmen employed at the furnaces receive on an average 9 francs per day of eight hours. Each furnace employs per shift 1 fireman, 1 weigher, 2 founders, 3 men to take away the slag, and 3 shovellers. The entire plant is organized in such a way that the handling of the ore from the mine to the furnace is reduced to a minimum. In fact the ore is handled only four times from mine to smelter, and each delivery, save to the roast heap, is effected by means of hoppers with inclined bottoms discharging directly into waggons. As has been already stated the average cost of mining the ore is at present 10 francs per ton, thanks to the open workings, the output of which comprises a large part of the

total production, and which enable the ore to be mined cheaply. This resource must in the future become exhausted and subterranean workings only resorted to, the cost of mining from which is about 15 francs per ton. This sum must necessarily increase in proportion to the difficulties met in the underground workings, and notably on account of the barren stretches, which will be considerable. It is true that there is good ground to hope for an increase in the nickel contents of the ore as the depth increases, but even on the basis of present results and a cost of from 20 to 25 francs per ton for mining and 10 francs for roasting and smelting it is evident that ores having an average contents of two to three per cent. of nickel and the same of copper will produce a matte in which the useful metals will carry a cost of 1 franc 50 centimes per kilogram of nickel contained, and 50 centimes per kilogram of copper; that is to say a cost very much lower than the probable market value of these metals in the future, all charges of refining being deducted.

Low cost of reduction to matte.

. . . To sum up, the Canadian ores, notwithstanding their relatively small percentage of nickel can produce this metal in the form of matte enriched to 20 per cent. at a very low price. This is due in great part to the ease with which the ores are treated and the richness of the deposits. The matte, besides nickel, contains copper, which must be separated by a distinct operation if it is desired to obtain pure nickel, while the mattes of New Caledonia do not require this supplementary process. It is true that these additional expenses are covered by the value of the copper, the refining of which is much simplified by the very fact of its separation from the nickel. On the other hand, the New Caledonia ore must go through a preliminary smelting before being given over to the refinery, while the Canadian mattes can be refined directly without a new concentration. These different considerations seem to balance each other, and it would seem that the two countries which are producing nickel at this time can strive with equal advantage so far as their respective cost of production is concerned. The advantage would certainly be with Canada if nickel were employed principally for making white alloys, as for this purpose it is only necessary to refine the nickel and copper together, but this method of employment seems to be more or less falling into disuse, and is being replaced by the use of pure nickel, especially for alloys with iron and steel.

Balancing considerations.

The Nickel of Commerce.

Impurities and alloys.

The nickel of commerce contains in general 1.50 per cent. of impurities, the principal of which, iron, has no injurious influence in the uses to which it is destined. It contains also carbon in the free state and combined, oxygen, a little sulphur and other foreign matters derived from the wasting of the furnaces. Nickel-copper alloys contain about the same impurities These alloys are delivered in the form of cubes or grains of different compositions, such as 90 per cent. of nickel and 10 of copper, or 75 to 25, but especially in the form of 50 per cent. of nickel to 50 per cent. of copper, approximately. The latter is a definite alloy which must always be taken as a starting point when one wishes to proceed with the manufacture of binary or ternary alloys of nickel. The makers of "maillechort," "argentan," "silverine," etc., usually buy their nickel in the form of the 50 per cent. alloy, and this combination is also the easiest to obtain from the refining of the Canadian mattes. At the same time, as the uses of nickel appear to be developing principally in the line of alloys with iron and steel, uses for which the presence of copper is inadmissible, it has been indispensable to obtain a method permitting of the complete separation of these two metals, and this at a cost not exceeding that of refining the Caledonian mattes, but taking into account nevertheless the cost apportionable to the copper as well as of the fact that the latter is partially refined by the nickel being separated. This question is all the more interesting to the nickel industry because the deposits of Canada form, as we

have seen, a factor in their power of production equal to those of New Caledonia.

The question of supply.

One of the difficulties in the way of the employment of nickel in those industries which might consume large quantities, as for example the manufacture of steel, is the fear of a premature exhaustion of the nickel deposits and the uncertainty of procuring the necessary supplies without unduly enhancing the price of the metal. The possibility of employing the nickel of Canada, or, which is the same thing, the possibility of a complete and economic separation of the nickel from the copper, is therefore a problem interesting in the highest degree to the nickel industry.

The problem of separating nickel and copper.

A separation of this kind can hardly, *a priori*, be effected except by chemical means, otherwise the wet process. The question is not a new one, because in the old metallurgy of nickel this metal, almost constantly associated with copper and cobalt, was separated from these latter by various methods, which always made use of the wet process either partially or wholly. There will be found in the works to which I have referred at the beginning of this memoir the formulæ for the methods of treatment by which the separation was attained. These operations, which belonged rather to the laboratory than to industrial practice, were profitable only because of the high price of nickel and cobalt at that period. The copper was, so to speak, sacrificed, and the purity of the nickel was only of very relative importance on account of the uses to which it was destined. The presence in the nickel of a certain proportion of copper was not only not objectionable, but even served to conceal the troublesome effects of the arsenic and sulphur which remained in the metal. None of these methods could answer the end which was desired, namely, the complete separation of the copper from the nickel. It would be tedious to enumerate all the methods proposed or attempted with this end in view. Mons. Badoureau cited in his memoir a large number of them, applied it is true to the ores of New Caledonia, but they have since then become very numerous, and patents have been taken out and are applied for daily for the same object. I recognize only as interesting experiments the processes based on the electrolytic deposit of nickel in a liquor containing copper. It appears possible to produce this separation, basing the process upon the difference in the electromotive force necessary for the decomposition of the salts of copper on the one hand and those of nickel on the other, the latter requiring a much higher voltage than the former. . . . . It is then possible, theoretically at least, to maintain in a bath of the sulphates of the two metals an electric tension below 1.877 volts and deposit the whole of the copy without the nickel. This reaction has been studied by Messrs. Siemens and Halske of Berlin, but I do not know up to the present time of the industrial application of the method. The chemically pure nickel deposited by electrolysis does not appear to conform to all the applications of this metal. It is especially, owing to the absence of carbon, unsuitable for the manufacture of alloys, for which it is necessary to employ the carburetted nickels.

The electrolytic method.

Garnier's new method.

Mons. J. Garnier announces in his work which I have already cited the application by an important metallurgical establishment of the United States of a process for the separation of the nickel and copper in the mattes of Sudbury, patented by himself, but he does not give details on the principle of the separation. This establishment, actually in construction near Pittsburgh, applies the process to the mattes produced by the Canadian Copper Company.

At the establishment of St. Denis, belonging to the firm of Christophle, they treat the ores of New Caledonia by the dry method and by the wet method conjointly. The latter is applied notably to the cupro-nickeliferous mattes obtained by a first fusion with pyrites containing copper and nickel. It is besides an additional operation; the separation is performed in a hydrochloric liquor. They commence by attacking the matte with hydro-

chloric acid, and then utilize the freed sulphuric acid for the precipitation of the copper from the solutions obtained in a previous part of the process. The iron is precipitated by oxidizing it by calcium chloride and a current of air. Finally the nickel is obtained under the form of a greenish, gelatinous, hydrated precipitate by means of milk of lime. This oxide can be either utilized for the manufacture of sulphate of nickel destined for electroplating, or dried, calcined and reunited to the oxide obtained by the dry way in order to be passed on for reduction.

Conjoint wet and dry processes.

The trouble with the oxide of nickel precipitated by lime is that it always retains a certain quantity of the impurities of the milk of lime employed for its precipitation. If liquid containing sulphates is worked with, one has moreover the inconvenience arising from the presence of the sulphate of lime dissolved in the water retained by the gelatinous precipitate of the hydrated oxide, which is very voluminous. This salt remains in the nickel throughout the calcination, and introduces during reduction sulphur into the metal. This latter trouble can be avoided by precipitating the dissolved sulphate of lime by chloride of barium before effecting in the hydrochloric liquor the precipitation of the nickel by milk of lime, or separating the sulphate of lime after calcination by treating it in the crucible with carbonate of soda. The part not melted is the purified oxide, but both these methods increase the cost of refining by the wet way. This difficulty of the purification and washing of the oxide of nickel precipitated by a base in a hydrated and gelatinous condition renders the adoption of the wet process, properly so called, impossible for the treatment of large quantities, or at least makes necessary the construction on an extraordinary scale of precipitation vats and washing apparatus, combined with filter presses requiring much hand labor, to obtain after all a product, the oxide of nickel, pressed into cakes, still containing more than 60 per cent. of water.

The Herrenschmidt process completely overcomes this difficulty in this sense, that the nickel is separated without requiring any precipitation, and that this separation takes place in the body of very concentrated solutions. Without entering into details of this operation, which I am not authorized to do, I may indicate that in principle this complete separation is obtained by the fixation of the copper by the nickel and the iron of the matte itself, and there is obtained on the one side the whole of the nickel in concentrated solutions which need only be evaporated to be transformed into an oxide by roasting and to be reduced by the ordinary process and on the other side a cement of copper which requires only to be refined in order to be put into merchantable form.

Pure Nickel.

The nickel of commerce, containing 98 or 99 per cent. of that metal, the manufacture of which we have just described, is not properly speaking a metal. It is rather a sponge of reduced particles artificially agglomerated, and consequently without cohesion. In order to study its properties and to utilize it, it is necessary to melt it in a crucible, an operation which requires a high temperature and much care, because nickel, which is unattacked by atmospheric agents at ordinary temperatures, oxidizes very readily at a red heat, and its oxide dissolved in a bath of the metal renders the latter brittle. It is also necessary to avoid contact with carbon, which would give a steel or even a casting of nickel with a considerably lower melting point. The operation is in general performed in a crucible under a layer of flux, and the metal is run into sand or shell according to the kind of articles it is desired to obtain. It is in this way that cast anodes destined for electroplating are made.

Nickel of commerce treated in the crucible.

When the nickel is to be rolled there is added in the crucible a few minutes before casting a small quantity of some reducing metal, easily oxidized, such as

magnesium, manganese or aluminium. Care should be taken to place this metal at the bottom of the crucible with a bar of pure nickel, or in refractory clay. It is probable that independently of the reducing action these oxidizable metals, especially aluminium, act on the oxide of carbon dissolved by the nickel, as has been shown in the recent works of Mr. Hatfield on the action of aluminium in the casting of steel. Pure nickel obtained under this form is malleable, ductile, and easily forged. Its tenacity is intermediate between that of iron and steel, and according to Deville its point of rupture is 90 kilograms per square millimetre. It melts like iron at a high temperature, softening at about 1,200 degrees. The presence of carbon renders it almost as fusible as cast iron. The density of the pure metal is 8.38. Its electric conductivity is almost exactly that of iron. We know too that nickel is magnetic. According to Poullet, it loses its magnetism at a temperature of 350 degrees. It is magnetized under the same conditions as soft iron. Under the influence of feeble magnetizing currents it is magnetized five and a half times more than iron, but with magnetic currents of considerable strength it is magnetized five times less. The question of the temper of nickel has not yet been completely studied. Denied by Boussingault, who probably had not at his disposal at that time (1878) nickel sufficiently pure, it has been recognized that nickel forms with carbon true steels and true castings. The question is at present being studied, and it is probable that in a short time the conclusions arrived at may be made public.

Qualities of pure nickel.

Nickel is rolled hot as easily as iron. It is forged, as before stated, and is welded to itself or to iron. This latter property has given rise in Germany, Switzerland and France to the industry of nickel-plating by welding two plates of given relative thickness, one of nickel and the other of soft iron, previously well scoured, by means of rolling them together. The two metals having similar coefficients of ductility preserve during the rolling their proportional thickness in such a way that one may obtain at will a plate of a tenth, a twentieth, etc. The iron may also be plated on both sides and in this condition employed in place of pure nickel for a multitude of uses and domestic objects, the more readily as this hot-plating, or more properly welding, has not the defect of scaling off during use as the electro-plated ware has. Nickel plated wire in virtue of the same principle may also be manufactured and drawn out to any desired number. The same operation, whether for the plating or the wire, can be carried on with nickel combined with copper. These sheets, plated on one or two faces, will take on a beautiful polish which is not affected by the air. They are employed notably in the manufacture of parabolic reflectors for lanterns in place of silver. The cost of these is much less than those made of silver, and their polish is as brilliant, although of a darker shade. They are also more difficult to scratch. Such sheets also admit of being stamped for the manufacture of cooking utensils, carriageware, etc.

Nickel-plating.

Independently of the plating, the pure nickel in leaves and threads is entering more and more into common use. As it is less malleable and less easy to melt or to mould than copper or brass, the appliances of the manufacturers who employ the latter metals are insufficient to utilize the metal, and on this account there is a certain delay in the manufacture of objects for domestic use. Nickel threads are employed very largely in passementerie. Lyons is the centre of a special industry of gilded and silver laces plated on nickel, which do not tarnish through use like those plated on white metal or brass.

Uses of pure nickel in leaf and thread forms.

Pure nickel is employed under the form of cast or rolled anodes in order to deposit on the surface of various objects previously well scoured a thin layer of electrolytic nickel, to which there is finally given a brilliancy by polishing. Becquerel was the first to make known a process of galvanic nickelling of metals by means of a neutral solution of the double sulphate of nickel and ammonia. This salt is still the base of the baths at present employed, the

Electrolytic nickel.

formulæ of which vary indefinitely. The important point is that the bath does not change and that it remains neutral during the whole operation. This is secured by placing in it the anodes of pure nickel, which are dissolved in proportion to the metallic deposit upon the objects to be nickelled. The process of nickelling requires a very strong current. A bath of 200 to 300 litres, for example, requires six Bunsen elements of 22 centimetres. For this reason the preference is given to electric-dynamo machines. The nickel bath consists generally of an aqueous solution of ammoniacal sulphate of nickel of 7 or 8 per cent., or say 70 or 80 grammes of metal dissolved in a litre. The bath should remain neutral to litmus paper. There is frequently added to it a substance known as the neutral salt of commerce, a mixture of phosphate and bicarbonate of soda with ammonia. The phosphate and bicarbonate increase the conductivity of the bath. In place of anodes of nickel, insoluble positive anodes of carbon may be employed, in which case the bath must be fed with crystals of ammoniacal salt of nickel. The foreign metals which would spoil the bath are precipitated by the daily addition of small quantities of sulphate of soda. The hot baths give the most brilliant precipitates, but less solid than those given by the cold baths. When the object is removed from the bath it is dipped in hot water and then dried in sawdust, and finally placed in a cloth and polished by the burnisher.

New process of nickelling

Heretofore nickelling has been done by the electro method. There is a new process based on a very curious reaction of nickel. Messrs. Mond, Land and Quincke have shown recently that if carbon monoxide be passed over nickel, beginning at a temperature of about 30 degrees, the two bodies unite and give a combination which may be condensed into a liquid boiling at 43 degrees. The nickel can be obtained by a reduction of the oxide by means of hydrogen. This very volatile liquid can be dissolved in benzine and petroleum. In vapor or in solution it is decomposed with a brilliant deposit of nickel under the influence of a slight elevation of temperature. In order to cover objects with a coating of nickel they are immersed in a solution or in the heated vapor at an elevated temperature. If it is desired to obtain plates of the metal by the electrolytic process or otherwise, depositing surfaces are employed coated with a layer of graphite. The processes of M. Mond are very practicable in the laboratory, and are based on an absolutely unexpected reaction which is interesting to note.

Alloys of Nickel and Other Metals.

Nickel and copper.

Nickel alloys very easily with copper in all proportions. Its action is exercised in the first place on the color of the alloy. As its proportion reaches 6 or 7 per cent. the metal whitens. At 15 per cent. the alloy is clearly white, and this proportion is only exceeded when it is desired to obtain a perfect whiteness. At 25 per cent. the maximum of effect is obtained. An alloy of this kind is susceptible of taking on a beautiful polish, with a clear reflection similar to that of silver. Air tarnishes this brilliancy, but with comparative slowness. Above 25 per cent. the increase of the proportion of nickel has no longer any effect upon the color. The addition of a small quantity of cobalt gives an alloy of perfect whiteness, even when the proportion of nickel does not surpass 16 per cent.[2]

[2] "Silverine" or "argentan" has a composition based upon this fact. Following is the formula for the alloy of "argentan" patented by Mr. Pirsch:

Cu	79 50	75.00	71.00
Ni	16.00	16.00	16.50
Co	1.00	2.00	1.25
Zn	1.00	2.25	7.50
S_6	1.00	2.75	2.50
Al	.50	.50	....
Fe	1.00	1.50	1.25

The last formula is that of a true maillechort.

White metals.

There is a constant confusion among the names and compositions of binary, ternary and multiple alloys of nickel known under the general designation of white metals. Under the name 'maillechort' an alloy is made of nickel, copper and zinc, containing a maximum of 15 per cent of nickel. The remainder is composed of two parts of copper and one of zinc. 'Silverine,' 'argentan,' 'packfong,' etc., contain other metals as well, such as tin, bismuth or antimony, which impart fusibility and a fine color generally at the expense of ductility. A certain quantity of iron is usually added if the nickel employed does not already contain it in order to give hardness to the alloy. Zinc produces a similar effect. The binary alloy of 90 per cent of zinc and 10 per cent of nickel is easily reduced to a galvanic powder and sold for this purpose under various names.

Production of the alloys.

The preparation, fusion and especially the casting of these alloys are extremely delicate operations, demanding skilled founders in order to obtain regular ingots. Whatever may be the composition desired we must always commence by making an alloy of 50 per cent. nickel to 50 per cent copper, and a sufficient quantity of the latter metal is afterwards added to produce the alloy desired. It is indispensable that the copper added should be of equal quality to that in the 50 per cent. alloy. For this reason certain careful founders prepare this alloy with their own hands. When the fusion is complete and the mass at rest in the crucible, it is stirred with a bar enclosed in refractory clay, the surface skimmed and the copper added, or the oxidizable metals which complete the alloy. A stick of green wood is also used for stirring the molten metal, which is generally cast in shell to prevent its cooling on the sides of the mould. Unlike copper and nickel, the white metals are rolled cold. Maillechort requires several reheatings before it can be made into leaves. These reheatings require minute precautions, which it would take too long to enumerate here. . . The binary alloy, 20 per cent of nickel to 80 per cent of copper, prepared in suitable forms, may be rolled or stamped in the cold with a simple annealing without intermediate reheating. This is of all the white metals the one that has been most carefully studied on account of its applications in the manufacture of ball casings for the new arms of small calibre and great initial velocity. The adoption of these arms necessitated the modification of the projectile, which would be destroyed or at least distorted in the barrel of the weapon if made of hardened lead as formerly. It was therefore necessary to cover the ball with a rigid case made of a metal sufficiently malleable to conform to the rifling of the barrel, and on the other hand capable of sustaining the explosion without being put out of shape. Lastly, it required an almost unoxidizable metal to secure the safekeeping of the ammunition. These several conditions appear to be realized in the alloy of 20 to 80 adopted by most of the nations of Europe for their new armament. . . An application indicated by the properties of this alloy is its use for locomotive fire boxes instead of copper. It is known that the great difficulty in the manufacture of these articles, besides the large size of the plates to be rolled (which reach usually $3\frac{1}{2}$ metres), is the procuring of uniformly good surfaces, free from flaws, bubbles or other defects which, acting as centres of oxidation, shorten the life of the fire-box. The relative slowness of oxidation of the white metals gives them from this point of view great advantage. But these plates should be scraped with an engraver's tool during the rolling process in order to remedy the faults which may reveal themselves. . .

The manufacture of covers and silvered objects, called 'Roolz,' 'Alfenide' or 'Christophle,' from the names of the principal French houses which deal in this sort of ware, constitutes an important outlet for nickel. The principle is well known, namely that of covering electrolytically a stamped or moulded article with a layer of silver of greater or less thickness. At first the metal

upon which this deposit was made was brass, but its use has been rapidly abandoned and replaced by that of 'maillechort,' which has the advantage of not appearing yellow when use has removed the silver coating. In America they even content themselves for the most common uses with covers of white metal not silvered at all, but simply polished, which replace for the western markets the old covers of tin. Hundreds of tons of alloys are consumed annually for this purpose. The valley of Waterbury in Pennsylvania is the centre of this manufacture, favored as it is by the existence of numerous water-falls and by the grouping of a population accustomed for a long time to the working of nickel and white metals. This industrial centre is well known for the manufacture of watch movements and cases of nickel or nickel plate at a low price which sell the world over. An important outlet for nickel.

In a review of the uses of nickel one cannot pass over in silence that which has so to speak vulgarized this metal, namely, its employment, or more exactly that of white metal, for small coins by a large number of countries, especially in the New World, in place of copper. The majority of States which belong to the monetary union have not yet renounced the use of copper coinage, notwithstanding its admitted inconvenience. Following is a list of the countries which have issued nickel money, and the date of the first issues in each: United States of America, 1853, 1864, 1869, 1871, etc.; Switzerland, 1858, 1874, 1881, 1883, 1889; Belgium, 1861, 1862, 1863; Costa Rica, 1867; Peru, 1863, 1864; Honduras, 1869, 1870; Jamaica, 1871; Brazil, 1871; Chili, 1871; German Empire, 1874, 1876, 1888; United States of Colombia, 1874; Japan, 1875; Venezuela, 1876, 1886; Mexico, 1882; Servia, 1883; Equador, 1884; Bulgaria, 1887; Romania, 1891; Argentine Republic, 1891. The issues are in general for 5, 10 or 20 centimes (or pfennigs). For the latter, Switzerland and Germany have struck pieces of pure nickel, which is more difficult to counterfeit and less subject to wear. They replaced pieces of 20 centimes or under in silver which circulated with difficulty. The United States has adopted a type of five cents, of which coins a certain quantity is struck every year in view of the growing needs of the population. Nickel money.

Mons. Levat also enters at some length into the question of the alloys of nickel with iron and steel, referring to the experiments of Riley at Glasgow, and to the tests of nickel steel armor plate for war vessels by the Navy Department of the United States. Riley's experiments have already been published in the report of the Royal Commission on the Mineral Resources of Ontario (1890) and the details of the U. S. Navy Department tests are referred to elsewhere in this report, *ante*, pp. 136-8. He goes on to say:

Production of Nickel.

The production of nickel remained almost stationary until the opening up of the mines in New Caledonia in 1878. It was at that time about 400 tons for the entire world. This figure increased in 1880 to 1,200 tons and to 2,000 tons is 1884. In 1886 the application of nickel to military purposes led to an immediate demand for this use alone of 400 or 500 tons per year, without taking into account the normal increase of consumption due to the development of the applications already known, so that in 1887 the annual consumption for the world may be placed at about 3,000 tons of pure nickel. Of this total the New World and the extreme East consumed about one-fifth, the remainder being used in Europe. At that period New Caledonia was almost the only factor in the production, and produced about 2600 tons of nickel yearly. Since then the mines of Canada, scarcely known in 1888, have undergone a rapid development. They are not hindered in that country by the difficulties of manual labor and transport which impede the work in New Caledonia, as we have already seen. The district of Sudbury, with three or four large Increase of demand for the metal.

Capacity of production of Ontario and NewCaledonia nickel.

furnaces in operation, is now in a position to produce a daily output of 12 or 15 tons of nickel contained in a cupro-nickeliferous matte, or about 4,500 or 5,000 tons per year. New Caledonia under existing circumstances is capable of a similar production, so that we may conclude that in a short time the total annual production of these two countries will be from 9,000 to 10,000 tons of pure nickel yearly.

Fluctuations of price.

The price of nickel has naturally fluctuated during the period when the new sources of production were being opened. In 1876 a kilogram of refined nickel was valued at about 18 francs. It fell a little later very rapidly to 10 francs, then to 6 francs, at which price it remained for some time. Since 1886 the metal has been more steady in its value, varying between 5.50 and 5 francs, depending upon the magnitude of the transaction. It is probable that the value, looking at the actual provisions for new outlets, will remain for some time at about this quotation. These prices are for the pure nickel refined, because one can deliver nickel either alloyed with the copper of Canada or under the form of the pig iron of New Caledonia at a much lower price, since the great part of the cost of refining will thus be avoided, if it were found possible to utilize to advantage the nickel in these intermediate forms.

IX.

CONSTITUTION OF NICKELIFEROUS PYRRHOTITE.[1]

By Dr. Stephen H. Emmens, President of the Emmens Metal Company, Youngwood, Pennsylvania.

The theory of replacement.

It is the custom of mineralogists to speak of many mineral varieties as formed by one metal "replacing" another to a greater or less extent in certain chemical combinations. This is, I think I may say, the invariable account given in the text-books respecting nickeliferous pyrrhotite, a mineral described as consisting of an iron sulphide in which "part of the iron is replaced by nickel." The object of the present paper is to enquire whether the account in question is a correct representation of the facts of the case, or whether the constitution of nickeliferous pyrrhotite differs from the description given in the text-books.

Formula of pyrrhotite.

The general formula of pyrrhotite is $Fe_n S_{n+1}$. This is sometimes written n (Fe S). Fe S_2 or n (Fe S). $Fe_2 S_3$; though probably, for reasons analogous to those recently set forth (Journal of Analytical and Applied Chemistry, vol. VI. No. 10, October, 1892), the more correct view is to regard the typical compound, $Fe_3 S_4$ as being a homogeneous body, and not as being composed of a mixture of sulphides. This question however is comparatively unimportant in the present discussion; as, whatever may be the precise arrangement of the molecules, their number will not be changed, and pyrrhotite will still be defined as an iron sulphide composed of n molecules of Fe and $n+1$ molecules of S. And, on the "replacement" theory, nickeliferous pyrrhotite will be a sulphide composed of x molecules of Ni, $n-x$ molecules of Fe and $n+1$ molecules of S. Let us test this numerical theory by the actual results of analysis.

Analyses.

At p. 74 of the 6th edition of Dana's Mineralogy is a table of analyses of various specimens of pyrrhotite. From this I will select the following for discussion, namely:

		S.	Fe.	Ni.
No. 14.	Brewster, N.Y.	37.98	61.84	0.25=100.07
" 15.	Putnam Co., N.Y.	39.28	60.03	0.78=100.09
" 15a.	" "	38.99	60.04	1.02=100.05
" 15b.	" "	39.85	58.73	1.53=100.11
" 20.	Frigido	39.65	58.18	2.17=100.
" 18.	Hilsen	40.27	56.57	3.16=100.
" 17.	Sudbury	38.91	56.39	4.66= 99.96
" 19.	Gap Mine, Pa.	38.59	55.82	5.59=100.

Demonstration.

Now it is obvious that any replacement of iron by nickel must take place by whole molecules weighing respectively 58.6 for Ni and 55.9 for Fe. Hence for every Ni molecule in mineral No. 14 of the above list there must be $(58.6 \div .25) \times (61.84 \div 55.9) = 259.3$ molecules of Fe; and, in like manner, there must also be $(58.6 \div .25) \times (37.98 \div 32) = 278.2$ molecules of S; or, in view of the analytical total being a little in excess of 100, we may regard the mineral as consisting of Ni $Fe_{259} S_{278}$ instead of Ni $Fe_{259} S_{261}$, as called for by the pyrrohtite theory.

[1] Reproduced by permission of the writer from the Journal of the American Chemica Society, vol. XIV. No. 10.

Similar calculations in the other cases give the following results :

No. 15.....	Ni	Fe 80.68	S 92.22	showing an excess of		S	9.54
" 15a.....	Ni	Fe 61.71	S 70.00	"	"	S	6.29
" 15b	Ni	Fe 40.24	S 47.69	"	"	S	5.45
" 20.....	Ni	Fe 28.11	S 33.46	"	"	S	3.35
" 18.....	Ni	Fe 18.77	S 23.34	"	"	S	2.57
" 17.....	Ni	Fe 12.685	S 15.29	"	"	S	0.60
" 19.....	Ni	Fe 10.468	S 12.642	"	"	S	0.174

In none of these minerals does the formula $(Fe\ Ni)_n S_{n+1}$ hold good ; and we therefore have reasonable ground for declaring that the constitution of nickeliferous pyrrhotite is *not* represented by this time-honored but somewhat superficial generalization.

Relation of sulphur to nickel in pyrrhotite.

It will be noticed that the excess of sulphur bears some relation to the percentage of nickel ; the lower the nickel contents the greater being the surplus of sulphur, and vice versa. This necessarily follows from the great size of the compound molecule when the percentage of nickel is small. If however we investigate the proportion borne by the sulphur to the total metal, we shall find a tendency to constancy rather than to variation, as is shown in the following table :

Percentage of nickel.	Proportion of S Molecules in Excess of $n+1$ to		
	Ni Molecules.	Fe Molecules.	Ni+Fe Molecules.
0.25	16.9	.0652	.0649
0.78	9.54	.1182	.1168
1.02	6.29	.1019	.1003
1.53	5.45	.1354	.1322
2.17	3.35	.1192	.1151
3.16	2.57	.1369	.1300
4.66	0.605	.0477	.04421
5.59	0.174	.0166	.01517

This suggests that the constitution of nickeliferous pyrrhotite is polymeric ; an inference which is also supported by the fact that Nos. 17 and 19, containing the high nickel percentages of 4.66 and 5 59, show less than 1 complete molecule of sulphur in excess, and therefore require a multiplication of their several figures. Taken as a whole however the results of analysis are opposed to any assumption of homogeneity of structure.

Physical investigation.

Coming now to physical investigation, we are at once met by a feature that is conclusive against the hypotheses of " replacement " and homogeneity. I allude to the fact that nickeliferous pyrrhotite may be divided into two portions, one of which is magnetic while the other is non-magnetic. This fact has long been known to chemists. In 1879 Habermehl effected a separation of the magnetic from the non-magnetic portions of pyrrhotite for the purpose of obtaining a pure mineral for analysis. In 1890 T. J. McTighe applied magnetic separation in the treatment of the nickeliferous pyrrhotite of Canada ; and in July of this year T. A. Edison applied for a U. S. patent, in respect of virtually the same invention, and filed a specification containing the following statement :

Treatment by magnetic separation.

"I have discovered that where magnetic pyrites, called 'pyrrhotite,' is nickeliferous, as it usually is to a more or less extent, the nickel is not distributed generally throughout the whole body of the pyrrhotite, but certain crystals are pure pyrrhotite or magnetic pyrites, while other crystals have some of the iron replaced by nickel and sometimes by cobalt, and that the crystals containing the nickel or cobalt are considerably less magnetic than the pure pyrrhotite." Edison's "discovery."

Any statement made by Mr Edison is deserving of respectful attention; but I believe that gentleman has frequently disclaimed anything beyond a rudimentary knowledge of chemistry and is therefore presumably open to correction in matters belonging to that department of science. Be this however as it may, I am safe in saying that pyrrhotite is rarely found in a crystalline form, and that crystals of nickeliferous pyrrhotite are as yet unrecorded as having been observed. Mr. Edison's mention of "crystals" is probably only a loose way of describing the minute fragments, particles or grains into which the massive pyrrhotite is divided by comminution.

Again, Mr. Edison speaks of the strongly-magnetic particles as being "pure pyrrhotite," meaning thereby a non-nickeliferous iron sulphide of the general form $Fe_n S_{n+1}$. My own observations do not confirm the statement that nickeliferous pyrrhotite can be magnetically separated into nickeliferous and non-nickeliferous portions. A separation into two very distinct minerals or mineral mixtures is possible, and these contain very distinct percentages of nickel; but both are nickeliferous. The following results obtained by Mr. C. T. Mixer at the laboratory of the Emmens Metal Company will illustrate this. Separation into two distinct nickeliferous minerals.

Two samples of nickeliferous pyrrhotite were taken, one from the Gap mine, Lancaster Co., Pa., and the other from a mine near Sudbury, Ontario. These were very finely powdered and then each sample was carefully separated by means of a magnet into three grades, namely, "magnetic," "feebly magnetic" and "non-magnetic.". The "magnetic" and "non-magnetic" grades were then analyzed and resulted as follows, after deduction of gangue: Results obtained from Gap and Sudbury ores.

	Ni.	Fe.	S.
Gap magnetic	0.35%	59.97%	39.68%
" non-magnetic	15.59 "	43.00 "	41.41 "
Sudbury magnetic	1.30 "	58.27 "	40.43 "
" non-magnetic..	23.16 "	33.92 "	42.92 "

Treating these figures in the same way as those of the analyses recorded by Dana, we have:

1. Molecular Constitution—

Sudbury magnetic.....	Ni	Fe 46.99	S 56.95	showing an excess of	S 7.96
" non-magnetic ..	Ni	Fe 1.535	S 3.394	" a deficiency of	S 0.141
Gap magnetic.....	Ni	Fe 179.6	S 207.6	" an excess of	S 28.
" non-magnetic.....	Ni	Fe 2.891	S 4.864	" a deficiency of	S 0.027

2. Proportion of Excess s to Metal—

Proportion of s molecules in excess of $n+1$ to

Percentage of nickel.	Ni molecules.	Fe molecules.	Ni+Fe molecules.
0.35	26.00	.1448	.1440
1.30	7.96	.1694	.1659
15.59	Slight deficiency of s.		
23.16	" "		

A comparison of the results here obtained with those from Dana shows conclusively that the magnetic minerals are of the pyrrhotite type, but that the non-magnetic concentrates are of a quite dissimilar constitution; and as the latter are much higher in nickel than the former it is also clear that the nickel is *not* present as an element replacing iron in pyrrhotite. It is also

apparent that the minerals Nos. 17 and 19 of Dana are mixtures of the magnetic and non-magnetic minerals found in the Gap and Sudbury samples examined by Mr. Mixer.

Much additional investigation is needed to determine the true constitution of pyrrhotite and its allied nickel compound. It may be that experiments as to the solvent action of molten ferrous sulphide upon iron disulphide and nickel sulphide will throw the needed light upon the subject. Many geologists are of opinion that the massive pyrrhotites of Canada and other places are the cooled remains of a molten mass ; and every parcel of matte produced from a smelter is an object lesson respecting the varying mixtures that are possible under such conditions. Provisionally therefore we may regard the constitution of the minerals under discussion as represented by the following formulæ :

Crystalline pyrrhotite ..... $n\,(Fe_8\,S_4)$
Amorphous do ..... $n\,(FeS).\,x\,(FeS_2)$
Nickeliferous do ..... $n\,(FeS.\,x\,FeS_2)\,y\,(NiS)$.

practical problem of magnetic concentration.

In conclusion it may be well to say a word as to the practical problem of the magnetic concentration of nickeliferous pyrrhotite. The two samples above referred to as examined by Mr. Mixer gave the following results :

1. Division of the total sample :

	Gap.	Sudbury.
Magnetic portion	58.66 per cent.	92.95 per cent.
Feebly magnetic portion.....	6.67	2.09
Non " "	34.67	4.96

2. Division of the total nickel contents :

Magnetic portion	16 25 per cent.	58.01 per cent.
Feebly magnetic portion.....	19.96	7.60
Non " "	63.79	34.39

3. Total gangue in sample :

Gap	41.28 per cent.
Sudbury	10.7

4. Division of the total gangue :

Magnetic portion	25.85 per cent.	75.51 per cent.
Feebly magnetic portion...	7.12	9.07
Non " "	67.03	15 42

5. Percentages of gangue in the portions :

Magnetic portion	18.20 per cent.	8.70 per cent.
Feebly magnetic portion.....	44.00	46.60
Non " "	79.80	33.20

The practical inferences from these figures are as follows :

1. Magnetic separation will give a rich nickel concentrate.
2. An ore with considerable gangue will yield more of its nickel as "concentrate" than will be the case with cleaner ore.
3. The concentrate from clean ore will be of a higher grade than that from ore carrying much gangue.
4. The nickeliferous portion of the mineral is attached to the gangue more firmly than is the non-nickeliferous portion.
5. The nickel is *possibly an essential constituent of the gangue instead of being a constituent of the pyrrhotite.*

This last inference is so opposed to the generally-received teachings that I have instituted a fresh series of investigations with a view to determine its correctness or the reverse. The results shall in due course be communicated to the Society ; and, in the meantime, all I can say is that at present they seem to favor the supposition of the gangue being nickeliferous.[2]

[2]Writing to me under date of April 8 Dr. Emmens says :
"I think that sometime in the course of the present year we shall introduce into Canada the practice of magnetic concentration of nickel ores. We have negotiations pending with some Duluth parties in this direction.
"I am at present investigating the cobalt question and am having some remarkable experiences with the Drury matte. Cobalt appears to be present in quite unusual abundance, and I also find some manganese, together with a new substance which, if not a hitherto unknown allotropic modification of nickel or cobalt, is a new metal."

X.

SOME NEW NICKEL MIENRALS.[1]

By Dr. Stephen H. Emmens of Youngwood, Pennsylvania.

I have of late had occasion to examine numerous samples of ores from the recently developed mining region known as the Sudbury district in the Province of Ontario, Canada, and in the course of such examination I have met with three nickeliferous minerals that appear to be distinct from any species hitherto described.

Folgerite.

This is found in the Worthington mine, on the Algoma branch of the Canadian Pacific railroad, about 30 miles southwest of Sudbury. The mineral deposit here opened up is of a character similar to that usually observed in the mines of the district; that is to say, it consists of a mixture of pyrrhotite and chalcopyrite, forming ore masses of approximately lenticular form and of varying magnitude, imbeded in a green stone dyke traversing the Huronian rocks that constitute the chief geological features of the region.

The pyrrhotite is in itself nickeliferous to a greater or less degree in every mine of the district, but at the Worthington mine it is found to be associated with a distinct sulphide (folgerite) carrying a very high percentage of nickel. This sulphide is spoken of by the local miners and newspapers as being millerite, but it differs widely from that species. Its chief characteristics are as follows: Characteristics of the mineral.

Lustre: Metallic.

Color: Light bronze-yellow in mass, but almost tin-white when broken up into fine grains.

Specific gravity: No determination of the pure mineral has been made, but a fragment associated with adhering pyrrhotite showed a sp. gr. of 4.73.

Hardness: 3 5.

Streak: Grayish black.

Form: Massive with a platy structure. No crystals have as yet been observed.

Fracture irregular: When comminuted the large fragments preserve a platy form while the smaller particles are finely granular. Very brittle.

Heat reaction: When the powdered mineral is heated in a closed tube no sublimate is produced.

Solubility: The mineral dissolves in nitric acid with separation of sulphur and a green solution.

Magnetism: In large fragments the mineral is non-magnetic. In minute grains it is magnetic. The finely triturated powder is non-magnetic.

Microscopic appearances: Under both lens and microscope the powdered mineral appears in the form of shining white grains of irregular form, very distinct from the shining spicules of a light brass-yellow color which constitute the powder of true millerite.

Chemical analysis: The specimens analysed were magnetically separated from the accompanying pyrrhotite and gave the following results:

Analyses

	A.	B.	C.
Nickel	35.20	31.45	29.78
Iron	33.70	31.01	26.89
Sulphur	31.10	37.54	43.33
	100.00	100.00	100.00

[1]Reprinted with permission of the author from the journal of the American Chemical Society, vol. XIV, No. 7.

Specimen A consisted of platy fragments, each one of which was tested separately with the magnet. Specimens B and C were separated in the form of a coarse powder from the accompanying pyrrhotite, and probably still contained some adhering particles of that mineral. In the cases of B and C the analysis was conducted by first roasting the mineral and then fusing with potassium bisulphate, followed by solution, peroxidation, precipitation of the iron and electrolytic separation of the nickel, all with the usual precautions. In the case of A the raw mineral was dissolved in aqua regia. The sulphur was estimated by difference; and a check determination (by fusion of the raw mineral with sodium carbonate and nitrate and final precipitation as barium sulphate) for sulphur only, in a fourth sample, gave 34 per cent It may also be mentioned that specimen A came from the Worthington mine, and that B and C were sent to me with the statement that they came from a deposit at the northeast extremity of the Worthington greenstone dyke. This deposit is distant about 1½ miles from the Worthington mine and has recently been explored by the Emmens Metal Company; but when Mr. C. T. Mixer, the chemist of that company, paid a visit of inspection to the workings, the person in charge who had sent me the specimens in question could not point out the place whence he had taken them, and could not show any further occurrence of the mineral *in situ*. It is probable therefore that A, B and C all came from the Worthington mine.

Locality of the mineral.

The formula corresponding with the above mentioned analysis is $Ni\ Fe\ S_2$, which corresponds to

Nickel	32.87
Iron	31.30
Sulphur	35.83
	100.00

This composition is between Ni S (millerite) and $Ni\ Fe_2\ S_3$ (pentlandite). It is also distinct from that of the "ferriferous polydymite" found at the Vermilion mine, a little to the northeast of the Emmens Company's working, and described by Clarke & Catlett (American Journal of Science, 1889, p. 372), as containing 43.18 per cent. of nickel, 15.47 per cent. of iron and 41.35 per cent of sulphur, and as approximating therefore to the formula $Ni_3\ Fe\ S_5$.

I have named this mineral folgerite after Commodore W. M. Folger, the Chief of the Bureau of Ordnance in the U. S. Navy Department, in recognition of that distinguished officer's achievements in the utilization of nickel steel.

Blueite.

Localities of the mineral.

This mineral has for some time past puzzled the Sudbury miners, who have locally dubbed it "Jack's Tin." It is found in several mines of that district and notably at the working of the Emmens Metal Company, where it is found associated with niccolite, gersdorffite, pyrrhotite and chalcopyrite in the outcrop of a quartz vein cutting the before-mentioned greenstone dyke.

Characteristics.

The following are the characteristics of the mineral:

Lustre: Metallic, somewhat silky.

Color: Pale olive-gray, inclining to bronze.

Specific gravity: 4.2.

Hardness: 3 to 3.5.

Streak: Black.

Form massive: No crystals have as yet been observed.

Fracture: Sub-conchoidal, irregular. Brittle.

Heat reaction: When the powdered mineral is heated in a closed tube a sublimate of sulphur is produced.

Solubility: The mineral dissolves readily in nitric acid without separation of sulphur and yields a yellow solution.

Magnetism: The mineral is non-magnetic.

Microscopic appearance: Under the lens the powdered mineral appears to be composed of irregular grains of a dull gray color. Under the microscope the color appears a dull grayish black and the particles are seen to be finely granular without any crystalline form.

Chemical analysis:

Nickel	3.5
Iron	38.8
Sulphur (by difference)	52.3
Insoluble	5.4
	100.00

After deduction of the insoluble matter (gangue) the figures for the mineral become

Nickel	3.70
Iron	41.01
Sulphur	55.29
	100.00

The sulphur is probably too high, as owing to the character of the gangue a portion of this latter may have entered into solution.

The formula $Fe_{12}Ni_2S_{26} = (Fe, Ni)S_2$ where Fe : Ni = 12 : 1) corresponds with the foregoing analysis, the figures of such formula being:

Formula.

Nickel	3.76
Iron	42.96
Sulphur	53.28
	100.00

The considerable percentage of nickel (a very rare element in pyrite) and the easy solubility in nitric acid without separation of sulphur seem to preclude this mineral from being considered merely as a nickeliferous variety of pyrite or marcasite. I have named it blueite, after Mr. Archibald Blue, late Secretary of the Royal Commission appointed to investigate the Mineral Resources of Ontario, and now Director of the Bureau of Mines of that Province.

Whartonite.

This mineral was brought to me by Mr. C. T. Mixer from a mine situated about seven miles northeast of Sudbury and about two miles from the Blezard mine, worked by the Dominion Mineral Company. It has been known locally as the Shepherd mine, and is of a character similar to the general mines of the district.

Locality and characteristics.

The following are the characteristics of the mineral:

Lustre: Metallic.

Color: Bronze-yellow.

Streak: Black.

Form: Cellular; the cavities being lined with minute cubic crystals and the intermediate substance being finely granular. This structure precludes the specific gravity and hardness from being determined with precision. A large piece showed a sp. gr. of 3.73 and a hardness of 4.

Fracture, irregular: Brittle.

Heat reactions: A sublimate of sulphur in a closed tube and fumes of SO_2 in an open tube. A sulphur flame is observed on heating a fragment held in forceps.

Solubility: The mineral is soluble in HNO_3 with separation of sulphur and a greenish yellow solution.

Magnetism: On comminution about 10 per cent. of the mineral is found to be magnetic.

Microscopic appearance: Under both lens and microscope the powdered mineral is seen to consist of grayish black grains of irregular form and finely granular structure, with occasional minute cubic crystals.

Chemical analysis :

Nickel	5.40
Iron	42.90
Sulphur	45.00
Insoluble	4.80
	98.10

After deduction of the gangue these figures give :

Nickel	5.79
Iron	45.98
Sulphur	48.23
	100.00

Magnetic and non-magnetic constituents.

Separate determinations of iron and sulphur were made in the magnetic and non-magnetic constituents respectively with the following results :

	Mag.	Non-Mag.	
Iron	66.55	40.4	} plus a little gangue ;
Sulphur	7.00	52.6	

and a qualitative examination showed that the nickel was clearly with the non-magnetic portion.

The inference deducible from these observations is that the mineral is a mixture of a nickel-iron disulphide with some magnetite ; and taking the proportion of this latter as being 10 per cent. we have for the composition of the other constituent :

Nickel	6.27
Iron	41.44
Sulphur	52.29
	100.00

Formula.

This corresponds to the formula $Fe_7 Ni S_{16}$ or $(Fe, Ni) S_2$ in which Fe : Ni = 7 : 1, and of which the figures are :

Nickel	6.10
Iron	40.68
Sulphur	53.22
	100.00

It may be that this non-magnetic mineral is in part composed of pyrite, in which case the formula will require modification. The aggregate however is distinguished by its form and nickeliferous character from pyrite and marcasite.

I have named this mineral whartonite after Mr. Joseph Wharton of Camden, N.J., in recognition of that gentleman's eminence as the head of the nickel industry in America.

Nickel and Nickel-iron Sulphides in General.

Relations of nickel and nickel-iron sulphides.

For the purpose of indicating the relations of all the known nickel and nickel-iron sulphides to each other, the following table may be found useful :

Name.	Percentage constitution.			Molecular constitution.			
	Ni.	Fe.	S.	Ni S.	Ni S_2	Fe S.	Fe S_2
Millerite	64.72	.....	35.28	1	.....	.....	.....
Polydymite	59.47	.....	40.53	3	1	.....	.....
Beyrichite	57.90	.....	42.10	2	1	.....	.....
Ferriferous polydymite	44.92	14.26	40.82	3	.....	....	1
Folgerite	32.87	31.30	35.83	1	.....	1	.....
Pentlandite	22.03	41.95	36.02	1	.....	2	.....
Horbachite	11.24	42.81	45.95	1	1	1	1
Inverarite	10.44	49.72	39.84	1	.....	4	1
Whartonite	6.10	40.68	53.22	.....	1	.....	7
Blueite	3.76	42.96	53.28	.....	1	.....	12

It remains to be added that the analyses of the new minerals herein described were made by Mr. C. T. Mixer, and that specimens of folgerite, blueite and whartonite accompany this paper for exhibition to the meeting.

XI.

A PIONEER'S MINING EXPERIENCE ON LAKE SUPERIOR AND LAKE HURON.[1]

By Walter William Palmer, Washington, D.C.

On landing at Quebec from England June 1st, 1848, and presenting letters, Mr. Bonner engaged me to proceed to Mica Bay on the east shore of lake Superior as surveyor to the Quebec Mining Co., and otherwise to assist Mr. Oliver Matthews the mining manager there at £100 per annum, Halifax currency, besides rations and suitable quarters. I wended my way via Montreal, Toronto and Windsor through red hot Canadian politics, and at the Sault found a delightful change in the association for a few days with Prof. Agassiz and a party of Cambridge students awaiting outfit to investigate the zoology of the north shore, and Dr. Charles Jackson and his assistants on their way to prosecute the geological survey of the south shore of lake Superior. Entertainment was found by inspecting the three and four ton masses of native copper from the Cliff mine, awaiting on the wharf for reshipment, and occasional familiar discourses by the professor on natural history and the glacial theory, and by Dr. Jackson on the igneous origin of the native copper of the south shore of lake Superior from its source in the sulphides on the north shore of lake Huron.

From Quebec to the Sault.

Agassiz and Jackson.

Mining on Mica Bay.

As soon as Prof. Agassiz and his party were despatched Mr. Peter Barboux turned his attention to me and the six miners for Mica Bay, and in due time we were on the way in a bateau and a canoe in charge of Charles Rousseau and a few Indians. We overtook the professor at his camp at Gros Cap, and found that he and his fresh blooded young men had been very attractive to the black flies and mosquitoes. As we made the traverse of Batchawana bay, and they went around it deliberately, they did not appear at Mica Bay until I had some glacial striae to show the professor on his arrival, and had settled down to my duties of seeing the written orders of Mr. Matthews properly executed. My spare time was filled in exploring the location and making a geological map of the same, and keeping up the new working plan of the mine, which employed about forty miners and was under the excellent foremanship of Mr. Joseph Rodda. The surface operations and fifty men were in charge of Mr. Clarke.

Settling down to duties.

Along in the fall our 11-ton sloop, the Sisquette, brought from the Sault John Bonner, the secretary of the company, and his son Charles, a lad of about 11 years, to spend the winter with us; also Mr. David Price of Chili to establish the Chilian method of making copper regulus (by wood).

Laying in a store of provisions.

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[1] Washington, D.C., 2000 R. street, 23rd Feb., 1893.

To Archibald Blue, Esq., Director of the Bureau of Mines for the Province of Ontario:

Dear Sir,—I have the honor to enclose you a few notes as far as my memory serves me of my mining experience in Canada on the lakes Superior and Huron, the mines there located being then considered the most important in Canada. With good wishes for the progress of the industry, I remain very truly yours, Walt. Wm. Palmer.

Mr. Palmer spent a portion of the past winter in Toronto with members of his family. He called upon me frequently and I persuaded him to furnish for the Report of the Bureau some account of his experiences in the copper mines of Ontario during a period now well-nigh forgotten. In this way the interesting paper which follows had its origin. Mr. Palmer is a native of Devon, England, and received an education there to qualify him for a mining engineer; and since leaving Canada, more than forty years ago, he has been devoting his life successfully to that profession in the United States and Mexico.—A. B.

The sloop was well freighted with provisions, luxuries, medicines, wines and spirits, and various barrels of beer for the hypothetical smelters. John Thompson Newton, the medical man, and Mr. Duffett the storekeeper had previously arrived.

The sloop returned immediately to the Sault to meet the bulk of the winter's provisions, which had been sent later by the propellor from Detroit, but after waiting a sufficient length of time she returned with only a remnant of previous freight and a French Canadian family which had been left at the Sault, and a letter from Mr. Peter Barboux containing the suspicions that the propellor had been lost. The weather was so rough that the sloop had to put into Mamainse harbor with the perishing family, whence a man arrived tattered and torn with the information. A volunteer crew were soon with a fair wind at Mamainse, but we could not return until late next day. A few crackers supplied to the children were meantime all the refreshments at hand. The father, mother and four children died within a few days after they were landed at Mica Bay; the remaining boy, about 11 years of age, was adopted by Mr. Bonner.

A sad episode.

On the Sunday that we buried the parents on a knoll at the head of the village it was bitterly cold and tranquil, and a dark brown pall of evaporization about two fathoms high apparently and close upon the water overlaid the mighty lake. Thence all was clear to the clear and cloudless sky covering the solemn scene.

In hopes that Mr. C. C. Trowbridge had duplicated the order for provisions, late as it was in the season, the sloop was at once dispatched again to the Sault, Mr. Bonner consenting to my joining so that in case of no provisions of ours being there I might scour the Sault for a cargo. We did find the duplicate supply and took all we could of it, worked our way up the river and in the snow and storm espied just before dark Parisian island, and with a heavy and fair wind at dawn the next morning were close by and heading between Mamainse Point and the rock outside. The discharge of an old Hudson bay wall gun brought Clarke and his crew with a whale boat, who took me on board, and the sloop was sent into Mamainse for the winter.[2]

Supplementing the winter's scant store of provisions.

A few days later Mr. Clarke, who was from the Hebrides and had been many years in the Hudson Bay Co's service, full of resources, invited me to join him and his crew of French Canadians to visit an Indian encampment at the mouth of the Montreal river. Taking the necessary salt we sailed up 12 or 14 miles and in a few days scooped out of the mouth of the river a dozen barrels of lake trout; these with about forty visits during the winter to the same and other Indians, with cariboo and other game in exchange for stuff out of the store, supplemented our scant winter's supply of provisions, and with close economy not only carried through 110 souls but also, with the aid of the salt fish and spruce boughs, a cow and a pony. In the spring however some half dozen men were laid up with the scurvy and required medical attention.

The work proceeded with as much earnestness, order, dignity and Sabbath observance as if we had under hand an incipient Calumet and Hecla. Birthdays were celebrated, especially my majority on December 27th, 1848.

Pioneer work on the location.

On my first arrival at Mica Bay, Mr. Matthews had already brought daylight on the surface of the front of the location by an avenue cut south from the head of the village to the lake shore; by a road to the mine about half a mile north; by another avenue felled on the course of the vein west to the lake shore, passing down hill over the two old lake beaches shown by me to Prof. Agassiz and referred to in his treatise on the Zoology of lake Superior. These beaches with the debris frustrated the

[2]Mamainse harbor is about six miles south of the open roadstead of Mica Bay.

object that Mr. Matthews had of exposing the back of the vein, which could not be seen until reaching the trappean sandstone of the wash of the beach, and there the vein was seen only obscurely. Soon after Mr. Matthews caused the felling of another avenue, perhaps a half a mile north of the mine, to a brook which debouched into the lake at a greater distance west, laying say four miles of the sinuous coast-line all come-atable from one point to another and surveyable from the interior.

Exploiting for copper ore by adit and shaft;

The rock in place exposed itself immediately above and emerging from the upper beach gradually ascending in hogback form towards the interior of the location. At an altitude of say 180 feet above the lake and a quarter of a mile from it, an exposure of gray copper sulphide invited exploitation by adit. This work commenced in trap sandstone and continued into sandstone trap (a transition rock), both reddish and rottenish, but periodically strewn with enough of those carrot-shaped and carrot-sized gray sulphides to induce continuance of the work, but at the same time not producing ore enough to pay half the cost of the candle bill. In due time a shaft had to be sunk to give ventilation to the adit, and in the progress of this work the same kind of ore was found. Sinks in the bottom of the adit to depths attainable by windlass also responded in the same unsatisfactory way to all efforts to find the ore in reasonable body, and up to the date of my leaving, on 1st June, 1849, a few bucketsful only had been saved from meantime findings.

but with a sorry showing.

Mr. Palmer returns to Quebec.

On the conclusion of my year's engagement with the company Mr. Matthews at my request kindly furnished me with a boat's crew to take me to the Sault, and in due time, having examined the Bruce on the way down, I presented myself to Mr. Bonner in Quebec, who thoroughly rated me for leaving Mica Bay and abandoning my future prospects. He stated that he had induced the directors since he had been down to increase my salary; also that he had shown my maps to Lord Elgin, who had been pleased to say that they gave him his first idea of a mine, and that his lordship had invited him to dinner, for which dinner he was indebted to me. After chiding me again he invited me to dine with him, which I did at his house on the Plains of Abraham, and with sincere regret I bade this good gentleman goodbye.

Prince's Bay location.

On this visit to Quebec in June, 1849, I met Mr. John Tregoning and some of his men on their way to England, after having spent the preceding winter in the exploitation of the Prince's Bay location, near Fort William. They had with them to show their company in England some beautiful specimens of netted plate work of native silver enclosing crystals of calc spar: but I was given to understand by Mr. Tregoning, who was an invalid, that beyond such specimens occasionally met with nothing of substantial value had been found. They had also suffered from scarcity of provisions. At Mica Bay we had no suspicion that any mining establishment save our own was working on the north shore that winter.

Visitors at Mica Bay.

During the whole year the only visits of note that we received were two calls, one on his way up and one on his return, from Prof. Agassiz and his students; one from Hugh Wilson, an annexationist from Hamilton; and occasionally during the winter from Father Kohler, a missionary among the Indians; and in the spring from Mr. Ballentine, assistant manager of the Hudson Bay Co., on his way home invalided, via Vancouver; and Sir George Simpson with his fleet of canoes on his way to the Pacific.

Agassiz.

The visits of scientific interest were those of Prof. Agassiz, who recognized on the decomposing slates on the south horn of the bay[3] fine examples of glacial striae. Upon his being shown by me the two terraced beaches, 80 and 160 feet respectively above the present one, he declined to give an opinion as to whether the water had receded or the land risen. Fur-

[3]The north horn is a felspathic promontory, Point aux Mines, on Bayfield's chart.

Michipicoten island.

ther he said that it was an open question, and was highly gratified with the specimens of current fish which we caused to be caught and preserved for him in whiskey, as well as with the results of his expedition since he left us on his way up the lake.

After its expulsion from Mica Bay the Quebec Mining Company turned its attention to Michipicoten and continued operations to the fall of 1853, when the writer met there Mr. Jehu Hitchins, an English expert from London, and with him a director of the company with a view to passing over the same to an English corporation. Failing this the writer caused it to be passed over to Mr. Chauncey Bush, the head of a New York company, who during the next two seasons spent considerable money in exploiting there for native copper and silver.

In the Employ of the Montreal Mining Co.

Officers of the company at Bruce Mines.

After a month's vacation exploring for Edward Thomas Renaud, the seignior of Berthier, I was sent to take charge of the mining department of the Bruce at £225 Halifax currency and quarters, and found there Archibald H. Campbell, the general manager; H. C. Pilgrim, clerk and cashier; Samuel Sedden Walbank, medical man; John Greenfield, purchaser and distributor of all supplies; Captain Wm. Harris, in charge of the general body of surface hands; and Captain Simmons, in charge of the miners and his share of the mechanics. Mr. Davis with a corps of Welsh smelters and masons was building a full set of reverberatory furnaces, six in number. Engineers and mechanics were busy bringing to completion the engine house, crusher and jigging buildings and corresponding machinery. Captain Martin, the ore dresser, in charge of men and boys, was gleaning stray ores from early surface blasts, spalling and prilling and hand-jigging the smalls of the past and current product of the stopes preparatory to crushing and smelting. James Carson, afterwards a famous mining speculator, was building by contract at the south face of the bay a row of frame houses for the miners with families and another row at the west for the accommodation of the smelters.

Life at the Bruce.

The Bruce had steamboat communication and calls from all parts of the lakes, and was a busy place with upwards of six hundred men in active employment; and a pile of Cleveland coal was accumulating which at the close of navigation amounted, less consumption meantime, to five thousand tons; and soon Mr. Acton appeared as custom house officer. The water supply for all purposes was drawn directly from the lake, generally at the end of the plank resting on a stone in front of the respective houses; the wash of the hillside finding its way also into the same reservoir. Vegetable supplies came; potatoes, cabbage, cucumbers, etc., from distant parts; and chiefly from Major Raines, who had two homesteads on St Joseph's island four miles south. A Catholic chapel had been erected for the French, Irish and Germans, and soon after another sacred building was placed at the disposal of the various religious sects; and a minister and also a schoolmaster were provided by the company.

The departments in the hands of energetic men.

As my duties were confined to the superintendence of the mining operations and preparation of the ores for the smelting works, I cannot say anything about the other departments, save that they were all in the hands of energetic men, able and faithful. On requisition, Greenfield supplied material and Harris any extra men. The accounts were rendered to Pilgrim, who paid the pay-rolls, and periodic reports from all were rendered to the general manager, whose spare time was fully occupied in the assay office.

The mine, and how it was worked.

Straight up northerly about a quarter of a mile from the wharf landing, the eastern stope of the mine was open to daylight, which, with a whim shaft 200 fathoms westerly from this point, formed the end limits of all that there existed of the Bruce mines proper.

The intermediate ground formed a serrated trench irregularly excavated by underhand stoping from 15 to 30 feet in depth along the apex of a greenstone ridge about 50 or 60 feet above the level of the lake.

The stopes in the eastern half of the vein exposure and up to where the vein took "horse" and split in two—the apparent main vein making a slight bend to the south—were uninterrupted and generally connected; but those in the western half were interspaced by benches of poorer ground.

The walls were clean and from four to six feet apart, and in the deeper stretches a slight inclination southerly was discernible by the drag of the windlass buckets.

The storms of the previous winter had persuaded Simmons, the mining captain, to house the stopes, and with a large part of his force he had stulled them, filled the gunnies above with refuse and capped the whole with clay from a neighboring bed found near the swamp north.

Five intermediate and nearly equidistant shafts had been reared from the deeper stopes, and the three western ones had their collars raised to about ten feet above the ground for dumps, and were equipped with horse whims, the whim rounds having been correspondingly raised and encased with circles of dry wall of clean massive vein quartz free of ore. The two eastern shafts were not yet below the reach of windlasses.

According to the system of underhand stoping which had been followed from the giving of the first shot in the mine by Colonel Rankin and Captain Harris, and which, in view of the coming demands of the smelting works had for some time to be continued, Simmons had everything in corresponding mining shape before my arrival.

Extent of the workings and number of miners employed.

The central shaft was about 100 feet deep, and already comparatively poor save in crystals of calc spar, some with double terminations.

The other four shafts looked fairly well and averaged at least two tons of 15 per cent. yellow sulphide for each square fathom of vein. The two western shafts were each about 60 feet deep on the vein, or about 70 feet each below their collars. The two eastern shafts were respectively about 40 and 50 feet below their windlasses. The stopes containing four of the shafts occupied the best stretches of the vein.

Simmons' force, now all underground, consisted of about 70 picked men, some at monthly wages but the majority on contract, all either sinking or stoping on ore, not one man being engaged in any dead work underground; and these men occupied two blacksmiths, whose task was to sharpen each 26 dozen cast steel drills per day.

There was no water in the mine, either by seepage or by subterranean springs.

SETTLING A LABOR TROUBLE.

An incipient unpleasantness settled.

The miners anticipated the impending race between the producing capacity of the mine, the crusher and concentrating works and the smelting paraphernalia, and those of them who had been hired in England at monthly wages came in a body and asked to be placed on a footing with the others on contract. By mutual consent the duplicate contracts were put into the office stove, and this just cause for discontent was allayed. The excessive store charges were complained of and remedied so far as they applied to the necessities of life, and a more exact system of measuring the ground was established on the owner's account.

How the Mica Bay venture ended.

Soon after this the last down boat of the season called at the Bruce wharf and had on board the whole of the outfit of Mica Bay. Mr. Bonner explained that they had been invaded and expelled by a horde of Sault half-breeds under the command of Angus McDonald and his friends. This visit enabled us to recoup our losses by cholera so far as numbers could do it, and we increased the force to upwards of 100 men. The boat then with some difficulty relieved her-

self from the ice which had formed while she lay at the wharf, and proceeded to Penetanguishene with the remaining majority of men, women and children and their effects, to be taken care of in Quebec by the Quebec Mining Company.

how the Bruce came to acquire odd types of mining men.

Some of the men that Mr. Bonner left had from their boyhood been western hap-hazard lead miners, and had never been brought under any rules of contracts. They knew all that was then known on human rights and the dignity of labor, of which our men had never troubled themselves. On the other hand Greenfield had lately brought up 100 Germans from Detroit, and among them were many ex-statesmen and ex-college professors who were masters in social science, having graduated in the revolutions of '48. Many of these, with the supposed ex-minister of Wurtemburg at their head, were now engaged in wheeling coal and carrying the buckets of beer and assisting in drinking it with the Welsh smelters, whose liberal supply of beer and whiskey allowed them often during the day and night, in their streaming perspiration, to drink to the prosperity of the Montreal Mining Company.

and how the Captain's tact mastered the men on set tling day.

Meantime the Mica Bay men had been good naturedly admittted and absorbed into the contracts, and had deliberately tested the quartz and complained that it was as hard as—well corundum. Whether it was the introduction and mixing a lot of men unacquainted with the ground, or whether it was the sight above them of a horizontal line of equidistant holes which made a square fathom of ground look larger than it ever looked before, was unknown; but soon after close of navigation the superintendent of the mine received some very neatly-written letters intimating that unless contract prices were raised dire personal consequences would be the penalty. The contracts were measured as usual without remark on either side, and on settling day Captain Simmons rang the bell as usual to call up the men. The only thing unusual on that day was that on invitation Mr. Campbell came to see the fine body of one hundred men.

The letters were read and their receipt acknowledged, but the settling of the contracts was suspended, pending the operation of a reward of £500 for the discovery of the writers.

The men made no remark and as quietly received the recommendation to keep the peace and to get from the store a winter's supply of provisions; but in less than a month a compromise was made by all of them taking the Scotch oath protesting innocence in the affair, and taking a contract to extend to the opening of navigation at a slightly reduced price per fathom. Thenceforth they worked during the whole winter in good earnest, and did well indeed in work and wages. Meantime the other departments were uninterrupted.

It is due to this fine body of men to say that they did not strike; that they did not destroy a particle of property; nor did I hear a disrespectful word. No one lost anything by this interruption. The company gained by the reduction in price, and the men gained at least 25 per cent. more wages by having a long stretch of a contract freed from the petty interruptions of monthly measurements. The sum and substance of the whole business was that on the 1st June, 1850, in addition to supplying the reduction works with current ore, Captain Simmons had a much larger accumulation of crude ore on the dump than he had when I arrived at the mine less than a year previously; and this though no improvement had taken place in the mine, and a few points had weakened considerably in depth.

ROLLS, JIGGS AND SMELTING WORKS.

Breaking and repairing the machinery.

The rolls passed the prills through comfortably, but soon corrugated badly on the second class ore, involving repeated passages of the ore and too frequent changes of the shells for the stock in hand of those necessary wearing parts. One night on stopping the engine to key on new shells the frost got into the crown wheel, and on starting up it broke into several pieces. The

contracted engine runners congratulated themselves that they had ahead a winter's holiday and a winter's pay, but this was frustrated by Henry Williams and his comrade, two miners, under whose managament a new wheel was moulded. They failed to fill the mould with cast iron from their improvised blast furnace built in a hogshead; but next refining day Mr. Davis was good enough to allow a half dozen men to ladle and fill the mould with refined copper. The wheel weighed 700 pounds, and I was told it did duty for some years afterwards.

Jigging machines.

Captain Martin with his few jigging machines in the confined building for winter operations attached to the engine house could easily take care of all the crop of ore that the crusher sized, and as the vitrified furnace bottoms near by gave way at uncertain periods he had still less trouble in supplying Mr. Davis with all the ore that he could turn into ingots.

A smelting works incident.

Up to May, 1850, the product of the smelting works had failed to respond to the mine estimates or to the quantity of metal that the assays called for, and the coal pile began to look small, so one day on visiting and informing him of these facts Mr. Davis ordered the furnaces drawn and all his hands to leave the building, and I was left alone to lock the doors, which I did and took the keys to Mr. Campbell. There was no defect in principle nor want of skill in the smelting works, which like the concentrating at first started in the face of winter when defects could not be corrected. Another season's work would have brought a more energetic fuel and a more tenacious sand for the furnace bottoms.

WHY THE MINE FAILED.

The vein unbottomed by jasper conglomerate.

But as for the mine, no skill could avert the inevitable. On his visit to the mine in 1848 Mr. Logan had pointed out that the pudding-stone (jasper conglomerate) which bluffs two miles east would unbottom the vein at an average depth of 250 feet, and the vein when he saw it was probably averaging four tons per fathom. Now it is said that Sir William, then Mr. Logan, estimated the ore in sight at 35,000 tons. Probably his data was: The ore exposure at the mine, 216 fathoms; the average depth at which the pudding-stone bed would unbottom the vein, 250 feet; the average value of the exposed face of the ore, four tons per fathom. These factors make nearly 35,000 tons. I have not the least doubt that the ore face averaged when he saw it in 1848 four tons per fathom. These are the only data now attainable to enable us to judge the rate of deterioration with descent. The Report of the Royal Commission, p. 378, says: "the Geological Survey volumes are silent on the enterprise." The concern was private property and the geologists observe corresponding proprieties. But is it reasonable to suppose that when Mr. Logan imparted to the officers at the mine his views on the unbottoming of the vein by this pudding-stone that the Directors of the Company would long remain ignorant of the skeleton? Again all testimony is silent, but from statements of the oldest inhabitants[4] it appears the Bruce and Wellington closed themselves in 1876 by the tapping of a body of water which inundated the mines, and by caving formed a lake of several acres, the level of which is about 25 feet above lake Huron. Mr. Wm. Plummer says "the deepest shaft was 500 feet." It looks as if this tapped the same conglomerate bed which at this depth had resolved itself into quick sand.

CLOSING MISCELLANEOUS NOTES.

Prohibition.

The general good order of the establishment at Bruce Mines was occasionally discredited by excesses which led to Mr. Greenfield's complying with orders to cut a hole in the ice and sink in the bay the stock of liquors. This anticipated remedy was however frustrated by outside parties from the Sault

[4] Not in the Royal Commission evidence.

supplying the stuff at St. Joseph's island. Many men took a walk there on the ice and a few never returned alive, and as the lesser of two evils a responsible man was licensed to open a public house. Thenceforth social relations took the normal form of average communities.

A general exodus,

About the 1st June, 1850, the Hon. James Ferrier with a mining man or two and some smelters arrived, but their progress on the wharf was obstructed by the exodus of nearly all the miners, all the Welsh smelters and many of the German ex statesmen with their effects—their pockets full of money and in a hurry to get off to the Sault by the same boat which brought him from Penetanguishene.

No curling dense black smoke from the proud stack of the smelting works piloted him into the bay, and the other operative works were in suspense pending the bidding adieu by the remaining fourth of the departing three-fourths. The officers were still intact, but when his wrath was cooled and he could proceed with deliberation he began by making short work of myself by passing all my troubles over to my successor, who soon vastly improved the concentrating works ; for either he or his successor, Archelaus Tregoning, had the good fortune to exhume from below the smelting furnaces in every smelting grade an amount equal to 100 tons of fine copper. So I was told by officers who afterwards joined me on the south shore of lake Superior.

which the head of the mining department joins.

Personals.

About these days the writer had the pleasure of meeting Col. Sam. Jarvis, Hon. Wm. Robinson and Sir Casimir Gzowski, then the Government engineer making preliminary survey on the Canadian side ; and also Jacob Houghton, a younger brother of the lamented first geologist of Michigan, surveying for the canal, which important work he soon after commenced and executed in the Potsdam sandstone on the American side of the Sault.

St. Joseph's island and its ancient fauna.

For the purposes of the Bruce Mines, Greenfield opened a limestone quarry on St. Joseph's island. It was profuse in a large breed of trilobites and vertebratæ consisting of fish, some of the latter as large as those of the present day found in the lake. This stone was used for the erection of the engine house and foundations for smelting works.

Rounding up the story.

A visit to the mines at Port Arthur in company with Messrs. Walbank and Pilgrim in 1875, and thence three visits to Silver Islet, a charter of Ambrose Cyrette's tug to the Little Pic, and a railroad passage through the formation of Sudbury in the Fall of 1890, round up all the writer knows about mining in Ontario.

XII.

NEW SOURCES OF PLATINUM.

By Dr. Stephen H. Emmens of Youngwood, Pennsylvania.

At page 270 of the recently published Census volume on Mineral Industries in the United States reference is made to the development of nickeliferous pyrrhotite mines in Canada, and it is remarked that "the impression has gone out that a small amount of platinum might also be obtained from the Canadian matte, but this does not seem to have been the case."

Platiniferous ore in Denison township Algoma.

That platinum exists in the Algoma mining district of Ontario has been known ever since the discovery of sperrylite at the Vermilion mine on lot 6 of the fourth concession in Denison township. This was found in the gossan of a vein of chalcopyrite, respecting which Dr. Robert Bell reports: "The vein occurs in diorite and is about four feet wide, but without distinct walls or any veinstone except a mixture of the country-rock."

This discovery led me to pay special attention to some mining work that was carried on in the summer of 1892 by the Emmens Metal Company at the Macdonnell mine on lot 12 of the third concession of Denison. This mine is situated on one of the eruptive dykes that characterize the district, and is thus described by Messrs. Ricketts and Banks who inspected the property in August, 1892:

"The surface of the greenstone dyke has been stripped at several places on the property and an inclined shaft sunk 37 feet at an angle of about 45° to the southeast, upon a mineral vein in the diorite near the southeast contact of the dyke, which latter, having a steeper dip southeast, is cut diagonally by the vein. The ore lens has a nearly parallel trend to that of the dyke. The seam or vein of ore at the collar of the shaft is about 6 inches thick; it pinches to about 3 inches at a depth of 20 feet, and then gradually thickens to the bottom of the shaft, where on the southwest side it is 13 inches thick. The vein filling is largely a changed diorite, with some little quartz and felspar, carrying several irregular seams and scattered bunches of chalcopyrite and pyrrhotite with admixture of nickel minerals. In the bottom of the shaft, in the northeast side, the seam has pinched to about an inch, carrying scattered sulphurets. In the hanging wall of the shaft in this locality scattered bunches of sulphurets are exposed. The ore seam where thin has a shaly dioritic filling, with thin seams of quartz and scattered sulphurets."

Analyses of specimens.

Samples of the vein matter were sent to me from time to time, and upon investigation I came to the conclusion that some of the mineral was platiniferous. Accordingly in July, 1892, I selected two specimens, one broken from a quartz seam in the mineral and the other from the graphitic schistose vein-matter which Messrs. Ricketts and Banks term "a shaly dioritic filling," and sent both of them to Mr. F. P. Dewey of Washington with instructions to examine them for platinum, gold and silver. The following are Mr. Dewey's certificates of assay:

1. Sample of quartz, etc.

Gold	slightest trace.
Silver	0.73 oz. per ton.
Platinum	trace.

2. Sample of graphitic schist.

Gold	slightest trace.
Silver	1.1 oz. per ton.
Platinum	0.53 oz. per ton.

It must be remembered that these assays were made without any concentration of the ore or separation of gangue. As therefore the sample of gra-

phitic schist sent for examination was a large piece, weighing nearly a pound, with very little show of sulphurets or other perceptible ore-matter, it seems almost certain that the concentrates from the same would furnish a platinum ore of commercial percentage. I did not however pursue the matter any further, because the working of the mine was abandoned on receipt of the report of Messrs. Ricketts and Banks who, having examined the property simply as a nickel mine, did not discover the occurrence of platinum.

The Canadian Copper Company's ores as a source of platinum.

Another source of platinum that has come under my notice is the "nickel oxide" manufactured by the Orford Copper Company from the matte produced by the Canadian Copper Company at Copper Cliff near Sudbury. This matte is the result of smelting nickeliferous pyrrhotite from the Copper Cliff, Evans and Stobie mines, and thus represents an average of the ore from a district some eight miles in length from southwest to northeast. One ton of the "nickel oxide" contains about 75 per cent. (dry weight) of nickel, and as the raw ore does not yield more than about 2½ per cent., each ton of oxide may be regarded as the concentrates from 30 tons of ore. In October, 1892, the Emmens Metal Co. purchased a parcel of some 18 tons of this oxide (representing therefore 540 tons of ore) and when engaged in refining the same I obtained a peculiar residue, which on examination by Mr. Mixer and myself proved to contain platinum in appreciable quantity. I accordingly sent a fair sample of the whole 18 tons of oxide to Mr. F. P. Dewey for analysis and he reported the precious metal contents to be as follows:

Analyses of nickel oxide.

Gold	slight trace.
Silver	1.00 oz. per ton.
Platinum	0.25 oz. per ton.

Prospecting for platiniferous ores in the Sudbury district encouraged.

It would appear therefore that some remarkable foundation exists for the impression referred to in the before quoted passage from the Census volume. It would also seem that a careful examination of the pyrrhotite deposits in the Sudbury district should lead to the discovery of small veins of arsenical ores traversing the greenstone dykes, and that these veins will, upon assay, prove to be platiniferous. I base this opinion upon three premises: first, sperrylite is an arsenide of platinum and occurs in one of the said veins; secondly, the vein at the Macdonnell mine in addition to chalcopyrite, folgerite and pyrrhotite, carried niccolite and gersdorffite, which are both arsenical ores; and thirdly, the "nickel oxide" above referred to contained an appreciable percentage of arsenic.

XIII.

LITHOGRAPHIC STONE.

By Dr. C. W. Volney of New York.

I have during the last two years made extensive explorations of the lithographic stone in the county of Hastings, and hereby report on some of the results of my investigations. Explorations in Hastings county.

I have to state that I could find but little in existing literature useful in distinguishing identification of good lithographic stone. Dana in his Mineralogy says: "Lithographic stone is a very even-grained compact lime stone, usually of buff or drab color; as that of Solenhofen." (Fifth ed. p. 679). But of an innumerable variety of limestones, all showing the above characteristics, only very few can be used by the lithographer. Experiencing difficulties in this direction, I collected a number of acknowledged lithographic stones and analyzed them, and the analytical results and observations are contained in my paper read at the Pittsburgh meeting of the American Chemical Society in December, 1892, and an advance sheet from its journal containing the same I enclose for the use of this report. It is as follows: Scant literature on lithographic stone. Chemical study of the stone.

'I regret that in preparing this report I cannot give an exhaustive reference to existing literature on this subject; what I have been enabled to consult did not give me the desired information, and in order to obtain material for comparison I analyzed some mineral from Germany. This was of undoubtedly good quality. Lithographic limestone is the product of different geological formations. If it is true that any limestone of fine, even grain can be use in the lithographer's art, it is equally true that such material seems to be very difficult to find, although we have immense tracts of calcareous deposits to select from. Of the various samples of limestone which have been tested for lithographic purposes, many show in outward appearance a very close resemblance in grain and structure to varieties known to be good, but prove nevertheless worthless. To ascertain the real cause a physical examination seems insufficient, and on the other hand the chemical examination, so far as has come under my notice, does not show sufficient grounds for the established distinction. I quote here the analytical results given in the Report of Mineral Resources of the United States, 1893, as follows: Stone of good quality difficult to find, and appearances are often misleading.

STONE FROM MISSOURI.

Silicates,	31.2
$CaCO_3$,	817.7
$MgCO_3$,	151.0
Fe_2O_3,	0.1
	1000.0

STONE FROM BAVARIA.

Silicates,	44.5
$CaCO_3$,	814.7
$MgCO_3$,	138.3
Fe_2O_3,	2.5
	1000.0

'Nothing here would indicate any practical difference, and as it is reasonably sure that in physical properties, fineness of grain, etc., these stones resembled each other, a distinction for practical use could not be deduced from Study of qualities by comparison

these analyses. To obtain however material for comparison I procured German stones of undoubted good qualities as lithographic stone, and selected two, one of dark blue and one of light yellow color, with these results :

DARK BLUE STONE FROM SOLENHOFEN.

Spec. gravity at 15.5°=2.952.

Analyses of German,

Insoluble silicate,	2.0000
Organic matter,	0.7200
$CaCO_3$,	90.9341
$MgCO_3$,	3.5710
Soluble silica,	0.5200
Al_2O_3,	0.5840
Fe_2O_3,	0.2360
FeO,	0.1300
Water,	0.4000
	99.951

LIGHT YELLOW STONE FROM SOLENHOFEN.

Spec. gravity at 15.5°=2.8388.

Insoluble silicate,	1.8930
Organic matter,	0.1320
Soluble silica,	0.0200
$CaCO_3$,	89.5390
$MgCO_3$,	4.3801
Al_2O_3,	0.1010
Fe_2O_3,	0.3210
FeO,	0.0030
Water,	1.3790
	97.7681

LIGHT GRAY STONE FROM KENTUCKY.

Spec. gravity at 15.5°=2.99331.

Kentucky,

Insoluble silicate,	11.500
Organic matter,	0.400
$CaCO_3$,	73.241
$MgCO_3$,	12.431
Al_2O_3, Soluble silica, Fe_2O_3,	1.141
Water,	0.935
	99.648

BLUE STONE FROM IOWA.

Spec. gravity at 15.5°=2.8173.

owa,

Insoluble silicate,	6.97500
Organic matter,	3.30000
$CaCO_3$,	82.20051
Fe_2O_3, Al_2O_3, Soluble silica,	1.07631
$MgCO_3$,	4.32703
Water,	0.24001
	98.11886

LIGHT GRAY STONE FROM MISSOURI.

Spec. gravity at 15.5°=2.7558.

Missour

Insoluble silicate,	4.300
Organic matter,	1.830
$CaCO_3$,	77.031
$MgCO_3$,	14.271
Fe_2O_3, Al_2O_3, SiO_2,	2.143
Water,	0.341
	99.916

LIGHT BLUE GRAY STONE FROM CANADA.

Spec. gravity at 15.5°=2.85156.

Insoluble silicate,	3.71200
Organic matter,	0.40910
$CaCO_3$,	89.98900
$MgCO_3$,	2.78932
Al_2O_3 and SiO_2,	0.73101
Fe_2O_3,	0.15302
FeO,	0.10431
Water,	1.25000
	99.13776

and Ontario

DARK BLUE STONE FROM CANADA.

Spec. gravity at 15.5°=2.89104.

Insoluble silicate,	3.6000
Organic matter,	1.2900
$CaCO_3$,	88.0341
$MgCO_3$,	2.5000
Soluble silica,	0.4900
Al_2O_3,	0.5770
Fe_2O_3,	0.3590
FeO,	0.0410
Water,	1.3601
	99.2512

lithographic stones.

'I observed that in a number of stones analyzed in drying at 100° a certain amount of organic matter volatilizes and escapes with the moisture contained in the stones. In most cases therefore the quantity of water will be found too high at the expense of organic matter. The latter contains nitrogen and traces of iodine, and is evidently the remnant of cretaceous fossils, and the silica may also originate from these fossils. It is certain that these organic remains cause the difference in the color; in fact they form the coloring matter of these limestones, and its presence does not seem to interfere by any means with the usefulness of the stone in lithographic art. It might be even presumed that the presence of this partially destroyed animal matter may have had some influence on the peculiar precipitation, and under great pressure on the fine and even formation of these peculiar strata. The material collected by me and the work done so far does not justify a final conclusion; but it is probably sufficiently strong to indicate it, and may give an idea for practical tests. In all other respects, with the exception of some stones containing too much silicious matter, the composition varies but little, and the differences are not pronounced enough to impair the quality of the stone for lithographic purposes.

Origin of organic matter in the stones.

'Whatever the influence may have been of this organic matter on the precipitation of calcium carbonate—holding this and other inorganic substances in suspension, retarding quick precipitation and thereby assisting in the formation of even grained and dense strata under subsequent pressure—it may be conceded that lithographic stone was formed during or after the destruction of a large and peculiar fauna, like the Jurassic and Silurian limestone periods; and if further analytical work should confirm what my present investigation seems to indicate, that this peculiar coloring matter is an essential feature of good lithographic stone, an identification of the proper material in the original deposits would thereby be greatly facilitated.'

Age of lithographic stone.

As already stated, this work was an outcome of my explorations in the lithographic stone districts at Marmora. The dark blue variety of Canadian stone is from a layer about seventy feet below the general surface of the country near Marmora, showing at the borders of Crow lake. Here some fifty feet of the overlying strata have been broken and washed away, not only exposing on the faces the different layers, but also enabling me to reach those underneath to the level of the lake. Of some twenty-seven layers examined by me only one gave encouraging results, and this is the dark blue variety, analyzed by me as above. In the fall of 1891 I removed a number of large

Exploiting the Marmora stone.

Tests of samples by lithographic experts.

sample stones from these layers and after proper preparation had these tested by lithographic experts. The mass itself proved to be excellent, and some stones of large size showed sufficient freedom from faults and especially from calcspar crystals as to encourage me to further proceedings. Finding that, for a proper and thorough investigation, machinery for cutting the stone was needed, I erected during the summer of 1892 at the quarry on lot 9 in the third concession of Marmora, buildings and machinery, and also derrick, etc., and from September until the end of November sawed and examined a considerable lot of stones from the layers of this quarry. I found layers, which are practically free from faults, especially free from the calcspar crystals, which have made so far all the lithographic stone from this district useless.

Works erected to prove the quality of stone in different layers.

An older deposit than the Solenhofen stone, and therefore of greater specific gravity, but an excellent material.

The lithographic stone of this section is a product of a much older geological formation than the Jurassic, and therefore more dense and specifically heavier than the stone from Solenhofen, which is shown by the specific gravities as given above. Its composition compares most favorably with the blue German variety, and the practical tests prove it to be an excellent material for all the different processes employed in the lithographic art and second to none.

Dip of the strata below the level of Crow lake.

A large capacity of supply.

The layers exposed by my quarrying at Crow lake have been disturbed from their original horizontal position and dip at an angle of about 5° in a southerly direction, whereby at a short distance south from the quarry they run below the level of Crow lake and will therefore make quarrying in that direction impossible. The field to the north and northeast however is free to a considerable extent, and shows a large capacity of supply. I succeeded in finding these same layers at another location east of Marmora, and have made arrangements for the working of these deposits in a business-like manner, so that it may be expected that a considerable quantity will be quarried and prepared for the trade during this year.

XIV.

ONTARIO'S MINERALS AT THE WORLD'S FAIR.[1]

By Dr. A. P. Coleman, Professor of Metallurgy and Assaying, School of Practical Science.

The history of the Province of Ontario is like that of every other country, largely founded on its geology. The southern part, with its level Palæozoic rocks covered with good soil, one of the most fertile parts of the continent, was naturally first settled with farmers having the virtues but also the defects of their class. The Silurian and Devonian rocks cropping out along rivers and lakes afforded building stone and lime for mortar, but very few other minerals of importance. If we mention gypsum, rock salt at great depths below the surface, petroleum and a few deposits of bog iron ore, we have exhausted the list of minerals economically important in southern Ontario. There is no coal for metallurgical or manufacturing purposes. There are no easily-worked placer mines to tempt her inhabitants into other lines of work. It is not surprising then that Ontario produced a fine, sober-minded, moderately prosperous race of countrymen, progressing quietly but steadily, afraid of hazardous ventures in business, knowing nothing of mines and minerals, and of the fortunes won and lost in them

The history of the Province founded on its geology.

The Laurentian and Huronian country in the greater Ontario to the north and west was non-existent to the hard-working man of the south except as a region of barren rocks and muskegs, where you might get some good pine lumber if the fires had not destroyed it, but that was worthless otherwise because you could not farm it. In spite of its immense area Ontario has reached its limit of rapid advancement according to old methods, and yet its people are afraid to venture on new and risky enterprises to develop the riches of the mining country to the north. Many a farmer and villager was dazzled by the gold of the Madoc region years ago, and sank hundreds or thousands of dollars in the vain search for gold. You cannot persuade these men to risk their money again in a Canadian mining enterprise, no matter how legitimate and safe. They have not learned the methods of handling such matters profitably. For some time to come we may expect Americans, Englishmen and everyone else except Canadians to develop and profit by our mineral resources until we have time to learn from them and gather the knowledge and courage to do our own mining and smelting.

The limit of rapid advancement reached by old methods.

New ventures are feared.

If anything could rouse the people of Ontario to the importance of what lies beneath their soil, instead of nearly at its surface, it should be the admirable collection of minerals prepared for the Chicago exhibition. It is to be sure by no means complete nor perfect in spite of the efforts of that enterprising and indefatigable collector, Mr. Boyle, who with the means at his disposal has done wonders; but it is complete enough to show that Ontario is one of the most promising mineral regions in the world. The collection has been formed chiefly to illustrate the economic resources of the Province, and properly enough much more care has been taken to display a complete set of the ores, building stones, etc., than to bring together a full series of the minerals occurring in the Province, whether economically important or not. Nevertheless the mineralogist finds in the collection much that is of interest from the purely scientific side.

The Chicago collection demonstrates the mineral promise of the Province.

In describing the collection the building and ornamental stones will be treated briefly first, the crystallographic collection taken up next, and finally the metals and their ores will receive attention.

Scope of the paper.

[1] A paper read before the Geological Section of the Canadian Institute in Toronto.

Building and Ornamental Stones.

Sandstones. Sandstones of good quality are represented from several parts of the Province, including several colors, especially gray, brown, red and banded.

Limestones. Limestones are present in considerable variety, including marls, lithographic stone, impure limestones suitable for hydraulic cement, and dolomitic or magnesian limestones.

Marbles. Among ornamental stones suited for monuments, pillars, etc., we find quite a variety of stones, often handsome in color. The marbles may be mentioned first, since they are most extensively represented. Marbles proper are exemplified in thoroughly crystalline specimens from the Grenville series of the Laurentian, but not sufficiently fine grained and pure in color to make good statuary marble. Less pure varieties, often hardly at all crystalline and colored with oxides of iron, clayey and bituminous matters, give a wide range of rich and often pleasing tints, uniform, or softly mottled, or boldly marked. Among them are found pinkish and deep salmon-colored stones, white mingled with gray or with green, combinations of brown and green, and dark gray or even black. Many of them take a fine polish and seem free from checks and fissures; and in all probability better samples will be obtained as the quarries reach greater depths below the surface influences of weather and frost.

Serpentine. With the marbles may be placed the serpentines of varying depths of green, and the mixtures of serpentine and whitish calcite, which display a pleasing set of soft colors.

Granite gneiss and syenite. Next to the marbles in importance are the granites and related stones, including gneiss and syenite. These have commonly in our Province tones of light or deep flesh red or purplish red, from the prevalent color of the felspar, but gray granite is also exhibited On the whole they are excellent stones of good color and take a fine polish.

Jasper. True porphyry scarcely appears in the exhibit, nor are the greenstones represented to any extent; jaspers of fine yellow and dark red tones are shown from Algoma, one under this head being really a red marble. The jasper conglomerate from Algoma with its red pebbles enclosed in white quartzite should make a beautiful ornamental stone, though difficult to work from its hardness.

Gneiss conglomerate. One of the most curious specimens exhibited is a kind of gneiss-conglomerate, consisting of gneissoid fragments enclosed in a schistose matrix, with varying soft tones of brown, purplish gray and green. This should make a handsome ornamental stone of a unique kind if it occurs in sufficiently large amounts.

The Crystallographic Collection.

In taking up the crystallographic collection, I shall include such economic minerals as do not come properly under the head of ores, in this respect gaining unity of plan but deviating from the arrangement made by the authorities of the exhibition. The order followed will be that of Dana in his System of Mineralogy.

Graphite. Graphite is represented from several points in the Grenville series of the Laurentian, sometimes in bands or beds several inches thick, having a foliated structure, at others mixed with pyroxene or magnetite, and still more frequently disseminated as scales through crystalline limestone. The last combination permits the separation of the graphite in a very pure state. The association of graphite beds with the crystalline limestones is very interesting to the geologist, as tending to prove the existence of plants and animals in those remote ages, even if the organic nature of the Eozoon Canadense of the same rocks should be denied. Of the other forms of carbon, diamond has not been found in Ontario, and anthracite only as a rarity in small pockets.

Molybdenite comes next in order, most specimens in the usual form of scales and plates very much like graphite, but having a slightly redder metallic lustre. The most interesting specimen is a large crystal from Renfrew county, a hexagonal prism in appearance, or perhaps rather two very sharp pyramids truncated by basal planes. It has much the shape of some mica crystals. Molybdenite.

Pyrite is of course a common mineral in the collection, and forms the usual brass yellow cystals with brilliant metallic lustre. The forms are of the ordinary kinds, cubes, octahedra and pyritohedra, with some globular concretions. Some of the cubes are an inch in diameter. The dimorphic form of iron disulphide, marcasite, occurs in Ontario near Port Arthur in fine specimens. Arsenopyrite, which is grouped with the ores, displays moderately good tin white crystals, isomorphic with marcasite. Pyrite. Marcasite. Arsenopyrite.

Of the group of haloid minerals fluorite and halite, or salt, are exhibited. The fluorite has the usual cubic form and handsome green, yellow and purple colors. It is associated with amethyst and with calcite and marcasite in specimens from Port Arthur. Fluorite.

The halite, or salt, cannot be described as a mineral, since it is prepared by the evaporation of brine and is not obtained in the solid form, though beds a hundred or more feet thick exist in the west of the Province. Halite.

Quartz occurs in many forms in the collection, massive for metallurgical purposes, as drusy crystals in geodes, and as beautifully clear rock crystals often quite large and presenting the usual prisms, completed by two rhombohedra at one or both ends, with subordinate trapezohedral planes. Some specimens are curiously abnormal and distorted; others have regularly arranged inclusions of hematite or göthite. As associated minerals we find pyrite, limonite and other oxides of iron, calcite, apatite and mica. Smoky quartz is shown from Sebastopol township, and the beautiful amethysts of Port Arthur are well represented. The latter are often large and show a zonal structure with varying depth of color. The growth by addition of material from without is exquisitely shown by specimens having a strongly colored inner pyramid enclosed in a paler shell, a crystal within a crystal. The splendid purplish violet is however seldom so uniform in distribution as to give stones fit for cutting as gems. With the Port Arthur amethyst we find common quartz, calcite, green fluorite, pyrite, galena and zincblende; some of the specimens making a small cabinet of minerals in themselves. A little chalcedony and specimens of jasper may be mentioned with the quartz No other oxides are included in the crystallographic collection except a specimen of spinel in calcite from Addington county. No examples are to be found in the collection, I believe, of the black spinels, sometimes called Kaladar diamonds, which occur in various townships in the eastern part of the Province as fine octahedral crystals. None of our spinels are transparent enough to serve as gems. Quartz. Amethyst, chalcedony and jasper. Spinel.

Calcite, one of the commonest minerals, is of course represented by numerous specimens with varying forms and colors. Some examples show the scalenohedral forms of dogtooth spar, others the prism ended by one or more rhombohedra, while many specimens of cleavage rhombohedra are shown. Some examples are almost ice clear, like Iceland spar, though none that I have seen are quite flawless enough for optical purposes. It is greatly to be desired that some new deposit of spar perfect enough for Nicol's prisms should be found to replace the failing stores from Iceland. The ordinary white translucent calcite is commonest, but a singular green variety is shown, and there are flesh-colored ones along with apatite from the phosphate regions. As associated minerals we find among others quartz, amethyst, fluorite, pyrite and galena. Few examples of other carbonates, such as dolomite or magnesite, are mentioned in the catalogue, though both I believe occur in Ontario. Calcite.

Rhodochrosite or manganese spar is shown from McKellar island, near Port Arthur, and described as argentiferous.

Manganese spar.

Orthoclase and microline.

Turning to the silicates, we find the potash felspars well represented. Besides large specimens of orthoclase with the characteristic rectangular cleavages and tones of flesh color or purplish gray, there are many examples of microclin, a triclinic form with a peculiar interwoven twin structure. Probably most of the large rough surfaced crystals from Sebastopol township are of this species, rather than orthoclase proper. There are several examples of green microclin, better known as Amazon stone, though not of specially fine color or crystalline form. One of the most beautiful minerals of the group is perthite, so called from the town of that name from its having first been found near there. It is really an intimate intergrowth of orthoclase or microclin with albite, a variety of plagioclase or striated felspar. Some of the polished specimens are of a very handsome deep flesh or orange red color, with yellowish gleams like aventurine or sun stone. This mineral should make pretty stones for sleeve links, brooches, etc.

Perthite.

Graphic granite.

Examples of graphic granite, an intergrowth of felspar with quartz, are common in Ontario, but scarcely represented in the collection.

Labradorite.

Of plagioclase proper few specimens are shown, a specimen of labradorite being the only one I find mentioned in the catalogue.

Pyroxene.

Pyroxene, or augite, is a very common silicate in the phosphate region, and is represented by numerous pale or dark green or black crystals, some of them very large and fine.

Tremolite and actinolite.

Hornblende, or amphibole of the ordinary dark green kind, is not largely represented, but its fibrous and acicular varieties, tremolite, which is gray or white, and actinolite, which is pale green, are shown as groups of long crystals or masses of radiating fibres. Some specimens might almost be described as asbestos, having slender parallel fibres, which are unfortunately brittle.

Sodalite.

Sodalite is a rare silicate of a blue color like lapis lazuli. Specimens are exhibited from Dungannon township, county of Hastings.

Garnets.

Garnets are very common in Ontario, and many specimens have found their way to the collection. They are chiefly the common dark wine or purplish red variety, almandine, but some rather fine examples of a yellow or brown garnet, probably essonite or grossularite, are shown. It is doubtful if any of our Ontario garnets are of gem value.

Scapolites.

Wilsonite.

The scapolites of the apatite region are of interest. Some are crystals of the usual form with primary and deutero prisms, pyramid and basal planes. They are gray or greenish gray and have a weathered appearance. The variety called wilsonite, which has a pretty rosy or pale purplish red hue, is found so far as I am aware only in the Ottawa valley, where it occurs in large masses, showing rectangular cleavage but not a definite crystal form. It received its name from Dr. Wilson of Perth, its discoverer.

Vesuvianite.

Vesuvianite comes from the Ottawa valley also, as brown crystals showing prismatic and pyramidal forms, sometimes with bright polished planes.

Zircon.

The zircons of Ontario are justly celebrated for size and beauty. Their crystals are frequently an inch square and have sharp, polished planes of a square prism and three pyramids. Splendid examples of geniculated twins, which are rarely found elsewhere, come from Sebastopol township. A very good example is to be seen in the collection. The colors are various tones of brown, wine color and reddish violet or lavender, and they often have a fine fire and lustre, though rarely clear and uniform enough to be cut as gems. These zircons are associated with felspar, hornblende, pyroxene and scapolite. It is perhaps worthy of mention that many of our granites and other rocks contain beautiful zircon crystals of microscopic size.

Cyanite and prehnite.

Cyanite is found as bluish blade-like crystals in the phosphate and other regions.

Prehnite comes next in the list with a specimen from the north shore of lake Superior.

Tourmaline is common in our rocks as the black variety, schorl. Specimens in the exhibition show the usual triangular striated prisms with rhombohedral terminations showing hemimorphy. One specimen consists of slender radiating dark gray prisms. None of our tourmalines are transparent enough to furnish gem stones. Tourmaline.

Among the most interesting Ontario minerals are the micas, which include muscovite or potash mica, phlogopite or magnesium mica, and biotite or magnesium iron mica. They all crystallize as prisms of the monoclinic system with a nearly hexagonal outline, and have an exceedingly perfect basal cleavage, so that they may be split into elastic plates much thinner than a sheet of paper. Muscovite specimens are comparatively few. They are much more transparent than the other species and yellowish, or in one example green in color. A specimen of yellowish muscovite contains innumerable brown or sometimes red plates of some other mineral between its cleavage plates. Phlogopite, the best represented species, forms one crystal weighing 400 lb., and affords plates half a square yard in area. This mica is amber brown in thin plates and dark brown or black in thicker specimens. Its use in stove windows and as an insulator for electrical machinery make it a very valuable product. Phlogopite occurs almost regularly in association with apatite and its accompanying minerals. Micas. Muscovite. Phlogopite.

Serpentine belongs to the same group of minerals as mica, and though it has been referred to under the ornamental stones the fibrous variety chrysotile, or asbestos, as it is generally called, may be mentioned here. This fibrous variety occurs as veins in massive serpentine, the fibres being really minute prisms arranged across the vein. Their fineness and flexibility are the most striking feature of the mineral, enabling them to be teased out and spun like silk or cotton. The greater part of the world's supply of asbestos now comes from the Province of Quebec, where the veins may be two or three inches wide and of a beautiful green silky lustre. The specimens sent to the exhibit from Marmora have not so pretty a color, but show veins almost an inch wide and with every appearance of good quality. If it should be found in large quantities, Ontario may divide the market with Quebec and Italy. Asbestos.

Talc belongs to the same group of silicates, and forms pale green foliated masses with a pearly lustre and greasy feeling under the finger. Excellent examples of talc are found in the collection, as well as of steatite or soapstone, an amorphous variety. Talc.

Kaolin comes next in order, examples of the pure white material having been brought by Mr. Borron from the Missinaibi river, near the sea coast of Ontario on Hudson bay. As pure white quartz sand is found in the same region, porcelain may yet be manufactured and another Sevres rise on the shores of Hudson bay. Kaolin.

The titanites or sphenes of Ontario are celebrated in museums, and excellent examples of all sizes up to portions of a 60 lb. crystal are to be found in the collection. The smaller crystals are often beautifully perfect with brightly lustrous planes. Some are twins. The colors are various tones of brown, sometimes with a fine yellow gleam. They come mostly from the apatite region and are associated with the same minerals. Titanite or sphene.

Apatite is perhaps the best known mineral of the Ottawa valley, specimens of its enormous crystals being found in all the important museums of the world. These crystals are not nearly so rich in planes as the small transparent specimens from the Alps, having as a rule only the prism and pyramid, though a deutero prism and the basal planes are sometimes added. Crystals from calcite often show gleaming polished surfaces, but generally have the edges rounded as though by melting or the action of a solvent. At times calcite fills holes or forms pebble-like inclusions in the crystals. The color is usually some tone of sea green or brown, though deep flesh red, purplish red and even black occur. The Canadian apatites are fluor-apatites, Apatite.

containing about 3½ per cent. fluorine. They are probably as pure phosphates as exist in nature, containing from 70 to 95 per cent. phosphate of lime, but the easily handled Florida phosphates form such serious rivals that comparatively little mining is now being done. Our apatite is associated usually with calcite, often of a fine flesh color, greenish pyroxene, scapolite and wilsonite.

Barite and celestite.

Of the sulphates, there are numerous specimens. Barite is shown as fine tabular crystals, and as white masses, the latter from near Port Arthur. Celestite, strontium sulphate, occurs in our Province as large, transparent crystals from the limestone near Kingston, as deep salmon colored masses of plate-like crystals from the Credit valley, and as radiating masses of prisms from Addington.

Gypsum.

Gypsum occurs in southwestern Ontario, and also in the Moose river region to the north as selenite in large cleavage sheets or as massive crystalline varieties.

In concluding this rapid survey of the crystallographic collection it is worth while perhaps to note the absence of some groups of minerals, such as the minerals containing rare elements found in the phosphate and pegmatite veins of Norway, which in many respects are very like those of the Ottawa valley. Do these minerals not occur in Ontario, or have they simply not been carefully looked for?

Absence of some groups.

The absence of true gems from the list is rather surprising, though of course the gathering of mere rarities and curiosities was not intended in forming the collection

Turning up Kunz on Gems and Precious Stones, I find mention of twenty-eight Ontario minerals that might be used as semi-precious stones, but none of true gems. Beside those that have been referred to in the previous notes, I find corundum as red and blue crystals in limestone from Burgess, pale green crystals of beryl from Rainy river, yellow tourmaline from Ross, agate from Michipicoten island, epidote and green prehnite from lake Superior, the moonstone or albite with bluish opalescence from Bathurst and Burleigh; pyrite, scapolite, ilvaite, zonochlorite and thompsonite. The emerald, ruby, precious opal and diamond seem not to occur in our Province.

Native Metals and Ores.

Tin.

All the important metals are found in Ontario, though not always in appreciable amount. Tin has I believe hitherto been observed only in minute quantities as cassiterite in connection with the platinum ore of the Vermilion

Bismuth and antimony.

mine; and bismuth chiefly in a few rare minerals or in specks of the native metal from Pierre Plat, lake Superior. Antimony too is rare, though stibnite has been found in Marmora in Hastings, and Sheffield in Addington county. Mr. Dewar's analysis of an obscure mineral from Barrie township shows 20 per cent of antimony.

Platinum.

Platinum exists in small quantities in the Vermilion mine as the arsenide, sperrylite, but perhaps not in workable amounts Up to the present the world's supply of platinum has come mostly as nuggets and dust from Russian placer mines; and as it is a valuable and costly metal, the discovery of work-

Sperrylite.

able deposits of its ore would be of great interest. Sperrylite is a tin white arsenide of platinum ($PtAs_2$), apparently isomorphic with pyrite. It has a brilliant metallic lustre, a hardness almost equal to quartz and the high specific gravity of 10.6. It contains besides platinum and arsenic traces of rhodium, palladium, iron and antimony, with some oxide of tin, the latter probably an impurity. It occurs with gold ores, pyrite, chalcopyrite and pyrrhotite.

Zinc and lead.

Two of the commoner metals, zinc and lead, occur in large deposits in Ontario, but at present are not mined or only in small quantities Zinc is

found chiefly if not wholly as the sulphide, sphalerite or zinc blende, on the north shore of Lake Superior, in veins from 2 to 16 feet wide. Lead also is found as the sulphide galena in several parts of the Province, and has been mined north of Kingston and smelted at that city.

Manganese is found in pyrolusite, a specimen of which is in the collection.

Manganese.

The most valuable and yet the cheapest metal of all, iron, occurs in inexhaustible quantities in our Province, chiefly in the ores, magnetite, hematite and limonite. Magnetite containing 65 per cent. iron with only traces of sulphur and phosphorus, declared to be equal to the best Swedish ore, is found in Belmont, Lavant and other townships toward the east of the Province, and also in the west at the Atik-okan range. In Marmora a porous, weathered variety is a strong natural magnet and readily attracts small pieces of iron. Its magnetism has no doubt been induced by the earth's magnetism. Hematite, massive, specular, micaceous, etc, has been found of good quality at various points in the Ottawa valley and west of Port Arthur. Limonite or bog ore occurs at Snowdon and various other localities in the Province. It is the only metalliferous mineral of importance found in the southwest peninsula of Ontario. Both hematite and limonite occur in ocherous varieties adapted to make mineral paints of yellow, red and brown shades. Siderites and clay iron ores do not appear to occur in Ontario in any large amount. It is greatly to be regretted that at present, with its immense stores of excellent ore, the Province mines little or none and smelts no iron, although iron was smelted at Marmora and other points in Ontario many years ago, and first class charcoal iron is now being produced at Radnor Forges in Quebec with no better ores or fuel. The occurrence of metallic iron in very peculiar concretionary globules at St. Joseph's island, lake Huron, has been described by Dr. Hoffman. No similar occurrence is known in other parts of the world.

Iron ores.

Magnetite.

Hematite.

Limonite.

A rare occurrence.

With the exception of argentiferous galena, the silver ores of Ontario are chiefly from the Animikie rocks near Port Arthur. Native silver occurs sometimes in large quantities in the mines about Port Arthur, and very handsome specimens have reached the collection, including white or yellowish plates and wire associated with white quartz, amethyst, purple fluorite, calcite, barite and such metallic minerals as argentite, blende, galena, pyrite and chalcopyrite. Fine octahedral crystals of silver have been obtained near Port Arthur. Argentite or silver glance, the black sulphide, occurs as commonly as silver itself and in much the same forms, plates, wire, and also as apparently amorphous masses. I am not aware that crystals have ever been observed in Canada. A specimen of animikite, a compound of antimony and silver (Ag_9 sb), associated with manganese spar, comes from the famous Silver Islet mine. The other two little known related minerals, macfarlanite and huntilite (a silver arsenide) from the same mine are not mentioned in the catalogue. The curious mineral from Barrie township in Frontenac county, analysed by Mr. Dewar and found to contain among other things 1 per cent. of silver and over 40 per cent. of copper, may be mentioned here. Whether it is a mixture of minerals or a definite compound deserving a name for itself one can hardly say at present.

Silver ores.

Native silver

Argentite.

Animikite, Macfarlanite and Huntilite.

A curious Barrie mineral.

Native gold, which is of course the most important source of the metal, is quite widely spread, especially in the Huronian rocks of the Province. Specimens associated in the usual way with quartz, oxides of iron and pyrite are found at many points, especially in the Madoc and Marmora region, the Sudbury region and Lake-of-the-Woods. Curious specimens of gold without quartz in green chloritic or hornblendic schist come from lake Wahnapitae. A very refractory ore of gold, arsenopyrite or mispickel, once mined in large quantities near Deloro, is well represented in the collection, and there is a specimen of a rare telluride ore, sylvanite (Au Ag Te sb Pb), from the Huronian mine, Moss township, west of Port Arthur. About the only mine in regular operation in the Province seems to be the Belmont mine, worked

Gold ores.

by the South African Mining Company near Marmora, though one hears of the Sultana and other mines on Lake-of-the-Woods, of the Ophir mine in Galbraith township, the Vermilion and other mines that promise more or less well. It is rather surprising to find no placer mining region in the Province, though perhaps all deposits of this sort were swept away or buried by the ice of the glacial epoch.

Copper ores.

Copper ores are widely found in the Huronian and immediately overlying rocks, including considerable quantities of native copper in irregular masses and plates associated with calcite, prehnite and laumontite. This native copper from Mamainse and other points north of lake Superior is precisely like specimens from the famous Michigan copper mining region to the south. Native silver is sometimes found welded to the copper but not alloyed with it, which proves that the metals were deposited from solutions and not in a state of fusion. The commonest copper mineral is chalcopyrite or copper pyrites, which is found in great quantities with pyrrhotite in the nickel region. Other sulphides represented in the collection are erubescite or bornite, well known for its peacock colors, and chalcocite or copperglance. The carbonates, malachite which is green and azurite which is blue, occur only sparingly. Cuprite, the red oxide (Cu_2O), appears associated with some specimens of native copper as small but brilliant crystals. At the present time none of these ores are being worked except incidentally in the production of nickel.

Chalcopyrite.

Malachite, azurite and cuprite.

Nickel ores.

A large part of the world's supply of nickel is now produced in the Sudbury region, the only rival which Ontario has in this respect being the French colony of New Caledonia in Australasia. On this account the nickel ores of the Province have a special interest. Pyrrhotite, a bronze-colored magnetic sulphide of iron ($Fe_6 S_7$ or $Fe_n S_{n+1}$) is by all means the most important of these ores, though it contains only two or three or at most a few per cent. of the metal, since it is found in enormous masses. This ore seems regularly connected with eruptions of diorite, diabase or gabbro in or beside Huronian rocks. It is not limited to the Sudbury region, since specimens come from near Rat Portage also. Analysis of Sudbury pyrrhotites prove them to be on the whole much richer in nickel than the same mineral from other parts of the world. So far as I am aware, no crystals of the mineral have been found in Ontario, although it is present in such vast deposits. In other regions tabular hexagonal crystals have been found as a rarity. Comparatively few nickel minerals proper occur in the Sudbury region, niccolite, gersdorffite and three newly-discovered minerals appearing to complete the list. Millerite was reported from the region, but the mineral was probably incorrectly named, since it formed only crystalline masses with a tabular cleavage, quite unlike the slender brass-yellow needles and radiating structures found in millerite from other parts of the world. The specimens which I have seen are probably folgerite. Gersdorffite, a sulph-arsenide of nickel (Ni As S), occurs as silver white or steel gray octahedra in niccolite and pyrrhotite from the Gersdorffite mine not far from Sudbury. It is very rich in nickel, but its amount is insignificant. Niccolite, sometimes spelt nickelite or nickeline, the arsenide (Ni As) is pale copper red in color when untarnished, and the richest ore of nickel found in our region (43.9 per cent.) It occurs with the previous minerals at the Gersdorffite mine. Three interesting new minerals have been described within the past year by Dr. Stephen Emmens, president of the Emmens Metal Co., of Youngwood, Pennsylvania. Folgerite (formerly called millerite) is a sulphide of iron and nickel (Ni Fe S_2), light bronze yellow, massive, with a platy structure, non-magnetic. The specimens come from the Worthington mine and form a very rich ore of nickel (Ni 31.45 per cent.) Blueite (named for the efficient Director of the Ontario Bureau of Mines) is pale olive gray inclining to bronze in color and non-magnetic. It is probably a mixture of nickel and iron bisulphides (Ni S_2 Fe S_2) with 3.7 per cent. nickel.

Pyrrhotite.

Gersdorffite.

Niccolite.

Blueite.

Whartonite is bronze yellow and cellular in structure, only partly magnetic, and contains 5.79 per cent. nickel with the formula $Ni\,S_2\,7Fe\,S_2$. It is possibly not an independent mineral, but a mixture. It is rather singular that none of the green silicate ores of nickel such as garnierite, the chief ore in New Caledonia, or genthite, formerly an important ore in the United States, have been found in any amount in Ontario, though the latter occurs on Michipicoten island. Another point worthy of remark is the very small proportion of cobalt found in our nickel ores, usually only a trace, while in Europe cobalt ores almost regularly accompany those of nickel.

Fossil Fuels.

Peat, lignite and petroleum

A brief reference should be made to the fossil fuels displayed in the collection, though these are comparatively unimportant. They include peat and lignite. The last is a woody brown coal like some mined in Europe. If large seams of it are proved to exist in the Moose river region the fuel question for that part of the Province is solved, but as it is found only in superficial deposits widespread beds are scarcely to be looked for. Our supply of petroleum is confined chiefly to the county of Lambton, though it is also found in the county of Kent.

A Museum of Minerals.

Species represented in the collection.

I have counted about 70 distinct species of minerals represented in the excellent collection sent to Chicago. In my reading I have found about 150 minerals referred to from Ontario localities, some 70 or 80 of which are not in the collection. Many of these have been found only in minute quantities, and none are of any economic importance, so that the collection represents very fairly and fully the mineral resources of the Province, and will undoubtedly do much good by calling the attention of the world to our undeveloped wealth.

Importance of a Provincial museum.

The Chicago exhibit on its return should be placed in some convenient building in Toronto as the foundation of a Provincial collection worthy of such a territory as ours. To it should be added from time to time new specimens, till all the Ontario minerals are well represented in it.

A good set of foreign minerals should be arranged in the same museum for comparison, and the whole should be open at suitable times to the public so that our own people may learn what a heritage they have and be willing to spend money in developing Canadian mines instead of Mexican ones.

An appendix has been prepared giving a list of all the species of minerals referred to in the literature of the subject as far as examined in the preparation of this paper. A few doubtful ones have an interrogation point after them, and a few others are rather synonyms than distinct species. The authorities referred to in preparing the list have been chiefly the Geological Survey reports, especially Dr. Hoffmann's list, and Prof. Chapman's works.

List of Minerals Found in Ontario.

Actinolite.
Agate, Michipicoten, Thunder bay.
Albite.
Allanite, Hollow lake, S. Muskoka river.
Almandite.
Amazon stone, Sebastopol.
Amethyst, lake Superior.
Amphibole=Hornblende.
Analcite, north shore lake Superior.
Animikite, Silver Islet.
Anthraxolite, lake Superior.
Apatite.
Apophyllite.
Argentite.
Aragonite, lake Superior.
Arsenopyrite, Marmora.
Asbestos (also mountain cork and leather) a variety of hornblende, Beaver mine, etc.
Asphaltum, Lambton Co.
Augite.
Aventurine.
Axinite, boulder, Prescott Co.
Azurite, Batchawana bay and Prince's mine.
Barite, McKellar island.
Beryl, Rainy lake.
Biotite.
Bismuth, native, Hastings Co., etc.
Bismuthinite.
Bismutite.
Blueite.
Bog iron ore.
Bornite, lake Huron.
Bournonite, Marmora and Darling.
Cacoxenite, near Brockville.
Calcite, Lanark, etc.
Cassiterite, Vermilion mine.

Minerals found in Ontario.

Celestite, Kingston, Credit Valley.
Chalcedony, lake Superior.
Chalcopyrite.
Chert.
Chlorite.
Chondrodite, Leeds Co.
Chrysocolla, lake Superior.
Chrysotile.
Copper, native, Mamainse.
Coracite, Mamainse (pitchblende partly altered to gummite).
Corundum, light blue and rose red, Burgess.
Cuprite.
Cyanite.
Datolite, Lacy mine, Loughboro'.
Diallage.
Diopside.
Dog-tooth spar.
Dolomite, Niagara.
Domeykite, Michipicoten island.
Eleolite, drift.
Epidote, Mamainse.
Epsomite, Marmora.
Erythrite, Prince's mine, lake Superior.
Essonite?
Fluorite, lake Superior.
Folgerite.
Galena.
Garnet.
Genthite, Michipicoten.
Gold, native.
Graphite.
Gypsum.
Halite.
Hematite.
Hornblende.
Humboldtine, Kettle Point on black shales.
Huntilite?
Huronite (altered anorthite) near Sudbury.
Hypersthene.
Iceland spar, St. Ignace Island, lake Superior.
Ilmenite?
Ilvaite? Ottawa.
Iron ocher, Grey Co., Simcoe Co., etc.
Isarite, part of black magnetic sands.
Jasper.
Kalinite, near Kaministiquia.
Kaolinite.
Labradorite, lake Huron.
Laumontite, north shore of lake Superior.
Lead, native, Kaministiquia.
Lepidomelane, Marmora.
Lignite.
Limonite.
Macfarlanite? Silver Islet.
Magnetite.
Malachite.
Malacolite or Diopside.
Marcasite.
Martite, Bass lake.
Melanite.
Melanterite, lake Superior and Hastings.
Meneghinite, Marble lake, Frontenac.
Meteoric iron, Madoc.
Microclin.
Millerite?
Molybdenite, Ross.
Molybdite, Ross.
Morenosite, Wallace mine, lake Huron.
Muscovite.
Niccolite, Michipicoten and Sudbury.
Oligoclase, Lanark.
Orthoclase.
Pargasite, Renfrew Co.
Pearl spar=Dolomite, in cavities and geodes Niagara formation.
Pectolite, Thunder bay.
Peristerite or albite, Bathurst.
Perthite, North Burgess.
Petalite, Toronto (boulder).
Petroleum.
Phlogopite.
Pitchstone, Michipicoten.
Polydymite, Sudbury.
Prehnite, lake Superior.
Pyrallolite, Ramsay and Rawdon.
Pyrite.
Pyrolusite.
Pyroxene.
Pyrrhotite.
Quartz.
Raphilite.
Rhodochrosite.
Rutile, Madoc.
Sahlite?
Scapolite.
Selenite.
Serpentine.
Siderite, lake Superior.
Silver, native.
Smaltite, McKim.
Soapstone.
Sodalite.
Sperrylite.
Sphalerite.
Spinel.
Spodumene, boulder near Perth.
Stibnite, Marmora, etc.
Stilbite?
Sulphur, native, Clinton.
Sylvanite, lake Superior.
Talc.
Tetrahedrite?
Thompsonite (zeolite, Chap.) Mamainse.
Titanite.
Tourmaline.
Tremolite.
Uraconite, Madoc and Snowdon on iron ores.
Vesuvianite.
Wernerite=Scapolite.
Whartonite.
Wilsonite.
Witherite, Twin Cities mine, lake Superior.
Wolframite, gneiss boulder, lake Couchiching.
Wollastonite, North Burgess, etc.
Zircon.
Zonochlorite, Nipigon bay.

XV.

THE UTILIZATION OF PEAT.

The interest which was noted in the Report of the Bureau for 1891 as having arisen on the question of a possible supply of cheap and efficient peat fuel for Ontario, has been maintained throughout the past year. In the absence of coal the circumstances of the Province are such as to require that all available information should be obtained on the subject, and all the light derivable from the experience of other countries cast upon it, in the hope that such a supply may be forthcoming. Prospects are held out that a manufactured peat fuel will be placed on the market during the present year at a price which will enable it to compete successfully with coal, and it may be that a solution of the problem which has been a perplexing one to experimenters is at hand. The facts given below as to the use of peat at the present moment in various countries of continental Europe encourage the hope that some method may be adopted here by means of which our extensive peat bogs may be made to serve as useful a purpose as those of Germany, Holland or Sweden. The difference between the cost of labor in Germany or Sweden and Ontario, though considerable, is not, it would seem, so great as to make it impossible to produce an article of similar quality here at a comparatively small advance in price In Sweden the cost of producing well-made turf for fuel is placed at $1.04 to $1.30 per ton according to price of labor, this being the principal item of cost. Making the necessary additions for other charges and for the higher price of labor in Ontario, there would appear to be still considerable margin left for profitable production at a selling price much below that of coal. In Germany the average rate of wages paid to men at the Government peat works on the Carolinenhorst moor is said to be $1 to $1.12 per day—a rate inferior, but not markedly so, to wages paid for corresponding work in Ontario. Yet the peat produced there is sold in competition with the plentiful supplies of coal raised from the coal pits of Germany itself, while in Ontario such competition would be with coal burdened with freight charges for a carriage of hundreds of miles, besides the customs duty. National habits and customs may count for something, but adherence to old established ways will hardly of itself explain the vigorous survival of the peat industry in Europe, and when the thrifty Dutch, Germans and Swedes find it to their advantage to burn peat instead of wood or coal, it is worth while for the people of Ontario to consider whether or not they cannot replace some of the imported coal used in their stoves and furnaces with a product of their own neglected peat bogs.

Interest in the subject.

Production in Germany, Holland and Sweden.

Cost of production.

At a meeting of the General Mining Association of Quebec held at Montreal on Friday, 7th April, 1893, the subject of peat was under discussion, two papers being read, one by Dr. R. W. Ells, LL.D., of the Geological Survey of Canada, and the other by Thomas W. Gibson of this Bureau, both of which are here reproduced. Dr. Ells' interesting paper deals with peat and its products, while Mr. Gibson's, it will be observed, treats of peat as a fuel only.

Peat fuel discussed by the Mining Association of Quebec.

THE PEAT INDUSTRY IN CANADA.

By R. W. Ells, LL.D., of the Geological Survey of Canada, Ottawa.

The importance of the peat deposits which are found in all the Provinces of Canada has long been recognized, and a number of attempts have been made from time to time to turn them to profitable account. Some of these have for a brief period given fairly satisfactory results, but all have owing to various causes gradually been abandoned. At present however there appears

to be a growing interest in the question of their utilization, and it is to be hoped that profiting by the mistakes and experience of the pioneers in the industry some more practical scheme than has yet been in operation may be devised, so that the manufacture of peat either for fuel or other purposes may be placed on a paying basis.

Interest of Ontario and Quebec in Peat.

This industry has a more important bearing upon the Provinces of Ontario and Quebec from the fact that while the inhabitants are here largely engaged in manufacturing pursuits requiring a large supply of fuel, it has long been a settled question that in neither of these Provinces can any natural supply of coal be expected. In Ontario this lack of coal for fuel may be to a certain extent met by the use of crude petroleum burned in properly constructed grates, and the experiments already instituted in that direction have shown that for heating and the generation of steam this substance possesses very many admirable qualities. In Quebec however this source of supply appears to be unavailable in so far at least as the researches in the Gaspé district, which may be regarded as our only oil field, have proceeded. Natural gas has also of late years entered the field as a possible competitor in the matter of fuel, more particularly in the Province of Ontario, though wells giving a limited flow of gas have also been bored at different points in the St. Lawrence area east and north of Montreal. This source of supply however does not meet the requirements of the case as satisfactorily as could be desired, owing doubtless to some extent to uncertainty as to its persistence, and also to the fact that it is unsuited to many purposes requiring a solid fuel. The fact also that the nearest available sources of coal fuel in eastern Canada are situated in the Province of Nova Scotia, the nearest of which to Montreal is about 700 miles by rail, while the great areas of Pictou and Cape Breton are still more remote, must also be carefully considered in the discussion of such a question as the utilization of the peat deposits near home. True it is that the adjacent Province of New Brunswick has a very considerable development of carboniferous rocks, and has been quoted by many as a great source of future supply of mineral fuel ; but from a careful examination of that country it must be remarked that owing to the thinness of the coal seams, rarely more than twenty to twenty-two inches, and the peculiar soft character of the coal itself which unfits it for much handling, as also for other purposes for which a good coal is now required, the utilization of this fuel must be to a very large extent merely local. The other remaining sources of supply, more especially for Quebec, are the distant coal fields of the British islands, from which during a certain portion of the year fuel can be cheaply brought at a low rate of freight, so cheaply in fact as to enter into close competition with the output of the Nova Scotia mines, and the deposits in the United States from which, owing also to canal transportation, fuel can be laid down at certain seasons almost as cheaply as from the lower Province. Still the fact remains that freight rates, both from Nova Scotia and the Pennsylvania fields, are such as to make the price of coal fuel laid down in the manufacturing cities of Ontario and Quebec so high that many of the manufacturing and mining industries in both these Provinces are seriously hampered owing to the comparatively great expense involved in keeping our steam engines in motion and in producing the power necessary to successfully and cheaply carry on the various industries of the country.

Fuel resources of Ontario and Quebec.

Petroleum.

Natural gas.

Coal of the lower Provinces

and the British islands as sources of supply.

The cost of coal a burden on industries.

Features of a Peat Industry.

The value of the peat deposits must however after all be merely a comparative one. If it can be conclusively shown that a peat fuel can be produced possessing let us say 100 heat units, and placed in the markets of Ontario and Quebec at a well defined less rate as regards cost than 100 heat units of coal, taking the coals of Nova Scotia and the United States in ordi

Conditions of competition with other fuels

nary use as the standard, then it should be apparent that our peat deposits are worthy of attention as an important factor among the manufacturing or power producing agents of the day. To do this however we must first of all consider several very important features of the industry, such as the extent of our peat deposits, the calorific power of well prepared peat fuel, the convenience of handling and the advantages it possesses, if any, over the fuel at present at our disposal, and in addition to this, and this is an especially important item, the cost of its manufacture.

In the utilization of our peat bogs we must bear in mind the fact that other phases of the question possess an equal if not even a greater present economic value than that of fuel supply. For instance the question of the application of peat to sanitary purposes for the reception and economic disposition of the sewage of our large cities is now being largely considered, and it has been ascertained that in this respect no substance yet known possesses presumably greater or more valuable properties than the produce of our peat bogs, so long regarded as practically valueless. Further, a comparatively new industry has come into prominence in connection with these deposits, which in Holland and elsewhere has already reached a very extensive development, and which should also permit handsome returns on capital in this country, viz., the manufacture of moss litter. This material from its great absorbent properties has been found to surpass all other substances in the utilization of stable waste, and for promoting the comfort and cleanliness and as a consequence the health of all animals there kept. So great is the importance of this industry, as yet comparatively unknown in Canada, that the peat bogs of Holland are now supplying the markets of London and New York with this prepared moss litter, with a demand apparently unlimited and at a price quoted in the London market of 21 to 26 shillings per ton according to quality, which should furnish highly remunerative results.

Its value for sanitary purposes,

and for litter.

Peat Deposits of Ontario and Quebec.

In the Report of the Geological Survey for 1845-46 attention was directed to the Canadian peat deposits, and the results of the investigation in this subject of Dr. T. Sterry Hunt appeared in subsequent reports. Among these of special importance are the articles in the Geology of Canada, 1863, and in the report of 1866. In the pamphlet prepared for the Paris Exhibition, 1878, further information is presented, more particularly relating to the trials carried on with the deposits east of St. John's in connection with the Hodges process, and at St. Hubert in the county of Chambly, at which places very extensive bogs of excellent peat occur. A very considerable quantity of prepared fuel was produced at these places, aggregating in 1875 about 13,000 tons in all, a small amount being used for domestic purposes, while the rest was employed by the Grand Trunk Railway for their locomotives. Changes in the company however appear to have acted unfavorably as to the continuance of this industry, and since that date but little has been done in this direction. A small quantity of prepared peat was also produced about the same time near Pt. Lewis in the county of Huntingdon, as well as at Newtonville near Port Hope, in Ontario Unfortunately no reliable data as to the cost of manufacture at either of these places are at hand, and no subsequent development appears to have taken place.

Early investigations by the Geological Survey.

Working the peat bogs of Quebec.

While the peat deposits of Quebec and Ontario are known to be very extensive, the greater part of these have hitherto remained untried. Among the best known may be mentioned for the latter Province the vicinity of the Caledonia Springs, lying to the south of the Ottawa in the township of Caledonia, county of Prescott, and certain bogs in Clarence, Cumberland and Gloucester, the latter in the county of Carleton. Of these the nearest the city of Ottawa is the Mer Bleue, which consists of two long peat bogs, separated by a narrow ridge of higher land and comprising in the two an area of

Bogs of eastern Ontario.

not far from 5,000 acres. These bogs were sounded by Mr. James Richardson of the Geological Survey staff and shown to have a depth in places of over twenty feet, the depth elsewhere ranging from five to fifteen feet. Three other large areas from 1,000 to 3,000 acres each occur in the townships of Nepean and Gouldburn adjoining, while other extensive bogs occur in Huntley and Westmeath. The depth of peat in these deposits varies from eight to over fifteen feet. Further south in the direction of Cornwall bogs are found in Osnabruck, Roxburgh and Finch, so that it is easily seen that a practically inexhaustible supply of material is found in the almost immediate vicinity of the Ottawa and St. Lawrence and in close proximity to the leading manufacturing centres. In western Ontario also peat bogs have been noted at many points, as in the vicinity of the Welland canal, and near lake St. Clair, as also in the counties of Simcoe and York, and farther west along the line of the Canadian Pacific Railway north of lake Superior, as well as on the route between that lake and Winnipeg.

and of western Ontario.

Inexhaustible supplies also occur in the Province of Quebec, as in Chambly, St. Hubert and in St. Brigide, where works have already been in operation. On the line of railway from Arthabaska to the St. Lawrence, opposite Three Rivers at Bulstrode, a bog was also formerly worked quite extensively, the product as air-dried peat being used on the Grand Trunk railway, as also in Huntingdon, Champlain, Lacolle and Sherrington, where a very thick deposit of excellent peat particularly worthy of notice is found. East of Valleyfield also and in St. Dominique extensive deposits occur; while on the north side of the St. Lawrence they are known in the townships of Grenville, Harrington, Mille Isles, St. Anne de Plaines, St. Sulpice, and Lavaltrie and St. Maurice. On the lower St. Lawrence peat bogs are found at River Ouelle, Isle Verte, Daquam, Matane, Macnider and other places; while on the island of Anticosti an immense bog estimated at nearly 200 square miles in extent occurs on the southwest coast, much of which is reported of excellent quality. From this brief enumeration of a few localities it is easily seen that the quantity of this possible fuel in Quebec is also practically unlimited.

Extensive bogs in Quebec.

Origin of Peat Bogs.

How bogs are formed.

Peat bogs are all of vegetable growth, consisting for the most part of the decomposed remains of plants and mosses, chiefly of the genus sphagnum, which have apparently filled up the basins of shallow lakes. The deposits are frequently underlaid by a layer of shell marl, which has constituted the original lake bottom. The peat bog frequently carries a growth of trees, often of tamarac in a stunted condition, with various heath plants, which by the decay both of their stems and rootlets help to swell the organic constituents of the mass. In bogs of a good depth the peat may be divided into three classes, viz: (1) the green living and growing surface, (2) the intermediate zone in which the remains of the plants are well defined, but which is capable of furnishing an excellent peat for certain purposes, and (3) the lower and fully digested material in which traces of organic life are comparatively rare, which possesses a rich black or brown color, and when free from inorganic matter furnishes a fuel of very excellent quality.

Three classes of peat.

Character of peat.

In character also peat varies somewhat owing to the nature of the underlying rocks. Thus moss peats are generally found on rocks nearly free from lime, such as granite or other strata rich in silica, while grassy or sedgy peats are more frequently found in calcareous districts. In the ripest or most thoroughly formed peat the decomposition of the organic matter has reached the last stage, the result being a dark brown or black homogeneous mass, comparatively dense and heavy. This when moist is firm, sticky and coherent like clay, and can be readily cut and moulded into any shape, and when dried it is hard, having on cut or burnished surfaces a lustre like pitch or wax.

DEVELOPMENT OF PEAT BOGS.

In the development or exploitation of a peat bog for fuel it will apparently be advisable to make use of that portion which is freest from organic remains, viz., that which occupies the lowest of the third strata just described, and in former experiments upon the large scale possibly it may be found that some of the lack of success which attended these efforts was due to the attempt to utilize an inferior portion rather than that most adapted to the manufacture of the best fuel. In this connection it may be wise to consider also that it is possible now to utilize the upper portion of the bog as well in the preparation of the moss litter, though the only attempt to develop this industrry in Canada so far as I can learn has been in New Brunswick. There several years ago operations were begun on a peat bog about fifteen miles west of St. John, at a place called Musquash. The promoters were capitalists from St. John and St. Stephen, and a brief account of their operations will be found in the report of the Geological Survey, 1889, by Mr. R. Chalmers. No attempt however was made to manufacture a peat fuel, owing presumably to the facilities possessed in this place for obtaining bituminous coal from the adjoining province of Nova Scotia, the freight from the mines in Cumberland county being low. In order to show however what has been attempted in this direction, I may here quote a brief extract from the report just referred to.

Best peat found in the lowest bed.

Upper portion valuable for moss litter.

"This article, moss litter, is used in stables as bedding for horses, etc., and owners of studs in the principal cities of the United States have been looking for a material of this kind prepared from the peat found on this side of the Atlantic. What they require is a spongy moss, sufficiently light and porous to be an absorbent of the liquids and ammonia which collect in stables, and which after being used in this way would make a fertilizer for gardens, etc. The company having purchased the bog at Musquash are now, 1889, erecting buildings and machinery there for the preparation of the article. They claim that the peat moss found in this locality is well adapted for the purpose intended, and is equally as good as the German moss litter. Hitherto a large amount of time and capital has been spent by the Musquash company in experimenting and testing the suitability of the different grades of peat or boggy material obtained here for the purpose in view, and it has been found that what is about half decayed, i.e., sufficiently so to be changed to a dark color and rendered somewhat short in the fibre without being absolutely brittle, is the best. This kind of peat is not found in the upper or living part, nor yet in the deep-lying rotted material, but between the two, where the mosses and rootlets are partially decomposed and the fibres strong enough to prevent the mass from crumbling to pieces. The chief process in its preparation is that of depriving it of the water, of which it contains from ninety to ninety-five per cent. This is effected partially in the pit by a machine called a plunger. The moss is then brought by tramways into a building and subjected to great pressure by passing between heavy rollers, and lastly the residual moisture is driven off by evaporation, after which it is packed into bales for shipment."

Utilizing New Brunswick peat for litter.

In the attempt to manufacture a compressed peat fuel of the first quality, or even an air-dried product, it would be well therefore to take into careful consideration the question of utilizing this second layer of say four to five feet for the purpose just mentioned, since it should if properly managed prove equally a source of profit as the manufacture of the fuel itself, while it would enable that portion of the bog best adapted for the latter purpose to be more readily and economically operated.

Two great drawbacks have hitherto been found in regard to the utilization of peat as fuel on a commercial scale, viz., the great bulk of the air-dried variety, thus requiring great storage facilities as well as excessive charges for transport, and the contained water, which even in the best air-dried qualities reaches 18 to 20 per cent. This contained water must of course greatly

Objects to be aimed at in the preparation of peat for fuel,

diminish the calorific value of the fuel, and it is the practical impossibility hitherto experienced of reducing this great percentage of contained moisture without very considerable expense which has apparently interfered with the successful economic use of the fuel in our manufactories and locomotives. In the matter of contained water air-dried peat ranks on a par with the best qualities of air-dried wood, but possesses this disadvantage that it contains a much greater quantity of ash, and also has a marked tendency to absorb moisture very readily, a feature which it is apparently very difficult to guard against. In the digging of peat also the precaution must also be taken to provide against the action of frost, since if frozen when wet its coherence is destroyed and it becomes useless as an air-dried fuel.

and difficulties to be overcome.

It is evident from a careful examination of the tests already made of our peat deposits that the objections already mentioned in regard to the air-dried product practically exclude it from the market unless for purely local consumption, and the future course of the industry as regards the fuel question must be along the lines of producing cheaply a thoroughly good compressed article.

In this connection due care must first of all, as already suggested, be paid to the quality of the raw material used. For while simple pressure will reduce the peat to a much smaller bulk, if the material is originally light and porous its natural elasticity will tend when once the pressure is removed to restore it to its normal condition. It has also been found in practice hitherto that the machines employed, no doubt in some cases owing to a lack of proper preparation of the raw material before subjecting it to pressure, have failed to thoroughly remove the contained water; and this has of necessity, if a drier article is required, to be removed by the application of artificial heat at a considerably increased expense, the value of the fuel however being found to be greatly increased by this action.

Quality of the raw material an important consideration.

As regards the specific gravity of the peat, this depends principally upon its position in the bog, and when uncompressed ranges from .25 to .9. In deep bogs a first-class peat of dark blackish or brown color and earthy fracture should have a gravity of .6 to .65. In carbon contents it ranges from 51 to 63 per cent. of the organic matter, its quality being due to its density and ripeness. From a series of experiments conducted by Prof. Johnson of the Yale Scientific School, it would appear that weight for weight the ordinary qualities of peat do not differ very greatly from wood for heating purposes. By compression its heating properties are very greatly increased. Thus it was found that while a good peat cut and air dried had a heating value of .80, the same condensed and containing 10 per cent. of water had a value of 1.48, and made into peat charcoal the value was increased to 1.73. Compared with wood, this value was found to range from .50 for poplar to 1.18 for summer oak. As compared with anthracite, tests made by the Water Department of Brooklyn showed the ratio of peat to this fuel to be as 1 to 2.25, and a table prepared by Prof. Johnson showing the comparative composition and gravity of peat, wood and anthracite is as follows:

Comparative value as a fuel.

	Carbon.	Hyd.	Ox. & Nit.	Ash.	Water.	Sp. Gravity.
Wood	39.6	4.8	34.8	0.8	20.	.75
Compressed peat	47.2	4.9	22.9	5.0	20.	1.20
Anthracite	91.3	2.9	2.8	3.0	...	1.40

Value of Coked Peat.

In regard to the manufacture of coke from peat, it may be remarked that its value has been known for many years. Thus we learn that as early as 1727 patents were issued in England for the smelting and manufacture of iron with this fuel, and in the Hartz mountains in Germany peat charcoal was used in metallurgical operations on a large scale in 1735, but it is stated that owing

Early uses of peat charcoal.

to the novelty of the process and through the agency of certain parties interested in keeping up the price of wood its use for this purpose was discouraged. Coke from simply air-dried peat is found to be too tender for use in the blast furnace, but that from compressed peat was regarded as equally as good for this purpose as that from bituminous coal. The results of its use in the blast furnace are however conflicting as regards its value, this probably being due to differences in the quality of the coke employed. From a number of trials made in Ireland it was held that the quality of peat coke was equal to that of gas coke, while the total cost according to Vignoles' process, in which the carbonization was effected by means of superheated steam, was about two dollars per ton (8s. 4d.) with the price of the raw peat at four shillings Three tons of peat were required to produce a ton of coke, the expense being reduced very considerably by the utilization of the bye-products such as wax, tar, gas, etc.

Tests in Ireland.

Probably in no country has the manufacture of peat fuel and charcoal been more successfully carried on than in France, and in the earlier reports of the Survey some valuable information will be found as the result of the study of the industry by Dr. T. Sterry Hunt at the time of the French exhibition in 1855. Among those who have brought the industry to to a high pitch of perfection may be mentioned Mons. Brughat, and a few extracts from a short pamphlet of his on the subject may here be given. After summing up the various analyses of peat, wood, coal and charcoal he says the calorific power of compressed peat made according to the Challeton process as compared with wood and coal is in round numbers as follows :

and in France.

Brughat's analyses.

Compressed peat, varying in value according to process of manufacture and containing 10 per cent. of water, from	3 to 4
Peat charcoal	4½ to 5
Bituminous coal, first quality	5
Anthracite	9½
Wood charcoal	1 to 1¾
Wood containing 25 per cent. water	¾ to 1½

In a special report by Dr. Harrington of McGill University, prepared in 1871 in connection with the peat deposits of the Province of Prince Edward island, assays were made of several of the peat fuels prepared from the bogs east of Montreal. The samples are from air-dried material and the assays are as follows :

Assays by Dr. Harrington of Quebec peats.

	1	2	mean.
Water (hygroscopic)	14.82	15.10	14.96
Volatile combustible matter	60.10	59.10	59.60
Fixed carbon	21.80	22.60	22.20
Ash	3.28	3.20	3.24

The assays of two samples of Hodges peat which had been kept within doors for a year are also given :

	1	2	mean.
Hygroscopic water	16.80	17.32	17.06
Volatile combustible matter	49.80	51.65	50.725
Fixed carbon	26.90	25.00	25.95
Ash	6.50	6.03	6.265

Economic Aspect of the Question.

The excellent paper published in the last report of the Bureau of Mines Ontario, on the subject of peat, sums up very concisely most of the information contained in the several Government reports, and supplements this with a great variety of facts bearing on the general aspect of the question. From this it would appear that the most recent tests with locomotives and stationary boilers do not give as good results as were anticipated, the percentage of

Recent tests may have been made with peat of

poor quality and containing an excess of water.

power to cost being very considerably lower than that obtained either from the use of bituminous coal or even wood. This would show conclusively that the quality of the peat employed was far from being what it should be judging from the table just quoted, containing presumably an excess of water greater than should be found even in a first-class air-dried peat. It is probable this peat was obtained from a portion of the bog not representing the best quality for fuel purposes, and thus shows that in the attempt to place this industry on a thoroughly satisfactory commercial basis great care must be exercised in the selection of the raw material. As Brughat has pointed out, repeated failures attended the attempts in this direction for some years both in France and Germany, and it has been only by a careful study of all the conditions not only as regards the material itself but the methods of manufacture that he claimed the success which he has at last attained. It seems difficult to realize the statements as to profit given by Brughat as stated in the report of the Ontario Bureau, but the claim he makes that one and a quarter tons of peat coal are equal to one ton of the best English coal for ordinary steam purposes, and for domestic purposes under proper conditions of draft and grate construction the value is equal ton for ton, deserves a careful consideration of the methods by which these results may be obtained by those interested in the furtherance of the industry in Canada. With coal selling at $3 50 to $4 per ton, which may fairly be assumed as the price paid in Quebec and Ontario in many places for even Nova Scotia slack for boiler use, a compressed peat capable of production at half that price should be profitably employed, while for house purposes where the price of bituminous coal reaches $6 and even in Ottawa $8 per ton, a first-class peat fuel should return very handsome profits to the producer.

Conditions of Brughat's success.

The great extent and apparent value of the peat deposits in this country, together with the very large present consumption of coal and the high prices paid therefor, would appear to warrant the most exhaustive series of experiments tending to solve satisfactorily the economic aspect of the question not only in the production of a fuel suitable in every way for domestic and steam purposes, but for employment also in the reduction of our iron ores and for the various other processes concerned with the manufacture of iron and steel. In this connection we may be permitted to quote again from Brughat:

Importance of careful experiments from an economical point of view.

"It is especially in metallurgical works that very great economy results from the use of our peat. We will obtain among other things both iron and steel of better quality than by the employment of either coal or coke from the use of peat, since the coke therefrom contains no sulphur as has been proved by numerous analyses made with the greatest care, as well as by the practical tests conducted in our forges and blast furnaces both in the manufacture of cast steel, cutlery, gun-barrels and in the casting of other metals."

In a paper of Prof. N. S. Shaler of Harvard University published in the tenth annual report of the U. S. Geological Survey, on certain fresh water deposits in that country, he remarks on the subject of peat that in his opinion a good peat fuel could be produced at a cost of $5 per ton with labor at $1.50 per day. In view of the results already obtained in the attempts to work the Canadian deposits as quoted in the Geology of Canada, 1863, and from the statements as to cost contained in Brughat's treatise, as well as those obtained from the manufacturers of this fuel in Ireland, we believe that a first-class article can be produced in Canada at a much less figure than he mentions. Such a result however will only be obtained by avoiding the mistakes already so often made by those who have attempted the solution of the problem, and by paying due attention to the quality of the material employed as well as to the use of the best appliances for compressing and preparing for market a fuel containing the least possible percentage of ash and moisture, and in this way obtaining results which will place this material more nearly on a par as regards effectiveness with our best quality of bituminous coals.

Cost of production.

Conditions of success in establishing a peat industry.

PEAT AS A FUEL.

By Thomas W. Gibson, Bureau of Mines, Toronto.

The uses of fuel may be roughly classified under four heads

Uses of fuel classified.

1. Domestic purposes, as cooking, heating, etc.
2. The generation of steam for industrial purposes.
3. The smelting of ores and refining of metals.
4. The production of illuminating gas.

Our Sources of Fuel Supply.

The substances which have hitherto been almost exclusively employed for these purposes in Canada as in most other countries are coal and wood, either in their natural condition or in the form of coke and charcoal.

The use of petroleum and petroleum products is not unknown in Ontario, particularly in the furnaces of steam boilers, and recent improvements in the method of combustion have rendered this fuel of importance where distance from the source of production does not unduly enhance its cost. Petroleum.

Natural gas has also begun to be used and is now in employment on a limited scale for manufacturing, domestic and illuminating purposes, but we are exporting for consumption in a foreign country as much as or perhaps more than we use ourselves, and the probability is that when we get ready to make use of it in earnest we shall find the supply very much reduced. Natural gas.

Wood as every one knows is becoming scarcer every year, and increasing scarcity brings its natural result—increased prices. In some country districts in Ontario with which I am acquainted the profusion of wood for fuel purposes which not long ago existed is now at an end. Of recent years such wood as maple has brought a higher price in the log than when cut into lengths for fuel, and the consequence is that farmers have sold their maple trees to saw-millers and their tops and branches only to the users of fuel. These of course are inferior to the body of the tree both for domestic and furnace purposes, and in such districts where wood was once the only kind of fuel thought of it is now a question as between wood and coal, with advantage in economy of price in some cases in favor of the latter. Wood.

Unfortunately we have no coal in Ontario. At least none has yet been found in the southern portion of the Province, though deposits of lignite are known to exist in the far off valleys of the Moose and Abbitibbi rivers on the Hudson Bay slope. The extent and value of these deposits are as yet unknown, as no systematic survey has been made with a view of determining whether or not they could be made available for economic use, but as they appear to occur in the drift it may be doubted whether they are likely to prove sources of important supply to the coal-users of southern Ontario. At any rate they are yet far removed from communication and means of transport, so that were they ever so valuable they must for the present be left out of consideration. Lignite on the Hudson Bay Slope.

It is quite true that everybody does not agree with the geologists, that we are below the coal bearing rocks in Ontario. It is natural to argue thus: We have been favored by Providence so highly in almost every other respect that it is almost inconceivable we should have been neglected in the matter of coal. Consequently we have heard in past years and still occasionally hear of discoveries of coal having been made in various parts of the Province, such as Collingwood, Bowmanville and several other points. Some months ago a very valuable deposit was discovered—just to put the geologists to shame—not more than eight miles from the city of Toronto, and so precious is the bed to its owners that they have not yet been able to bring themselves to part with any portion of it, or even to raise it to the surface. No later than this week the Bureau of Mines was in receipt of a letter from a man who by means of a divining rod of his own construction had located a seam of coal eight feet in Pythonic prospectors who locate coal beds in Silurian rocks.

thickness in western Ontario, which upon receipt of a suitable bonus from the Government of the Province he was willing to develop. The advisability of granting such a bonus, I need hardly say, remains under the Government's most serious consideration!

Sources of our coal supplies, and aspects of our situation.

But the lack of coal within our own borders leads to serious consequences. The coal we use comes almost wholly from the mines of Pennsylvania and Ohio, and whenever the gentlemen in control of these mines say "Thumbs up!" on the other side, thumbs have to go up on this side also. Were there even unrestricted competition among the producers of coal in the United States, we could hope to get it in Ontario at the lowest price for which it could be profitably sold, but rings and monopolies govern the production and sale of this important article, and we are thus entirely within the power of foreign corporations who cannot be reached by Canadian laws, and who have "neither bodies to be kicked nor souls to be damned." Nova Scotia, the only other possible source of supply, has unfortunately been shown by experience to be too far removed from our markets to admit of our drawing upon it for any considerable part of our requirements.

In view then of the increasing scarcity and dearness of wood and of our coal supplies being in a foreign land and the subject of an odious monopoly, we are, it seems to me, in presence of a situation which demands our instant and most careful consideration. How are our private and public interests to be protected?

Is there Escape from the Situation?

Will electricity solve the problem?

There are those who hold out the hope of escape from the situation by means of electricity, that force which has already done so much and which is to solve every possible problem of transportation, lighting, heating, smelting and power. Fuel is not required, they say, for the generation of electricity where you have sufficient water power, and in the undeveloped rapids and falls of the upland regions of Ontario where the headwaters of the Muskoka, the Madawaska, the Petawawa, the Bonnechere, the Mattawa, the Severn, the Otonabee, the Trent and many other streams take their rise, not to mention the immense potentiality of the falls of Niagara itself, lies the ultimate solution of the fuel question of Ontario. But while the grass grows the steed starves. There are many and great improvements to be made in the generation, transmission and utilization of electric force before these distant sources of power can be made available for the ordinary purposes of every day life, and some greatly superior means of transmitting electricity through long distances especially is required before that form of force can be expected to supersede for all uses the chemical energy evolved by the oxidation of carbon.

Utilization of peat in older countries.

In older countries, where wood has become scarce and coal for various reasons unavailable, recourse has long been had to peat as fuel, both in the ordinary air-dried form and in a manufactured condition after treatment by various processes. In Ireland, Scotland, Germany, France, Russia, Norway, Sweden and every other European country where peat is found—and it occurs in almost every country lying within the temperate zone—a large proportion of the peasantry have for centuries depended almost entirely upon peat for heating and culinary purposes. I do not need to give any description of the ordinary method of cutting and saving peat, which is practically the same in all lands. It is cut with spades or tools of special form into brick-like blocks, which after sufficient exposure to sun and air become dry enough to burn. This is the method employed where a peat bog can be entered upon and dug with safety and convenience. Where the peat occurs as it sometimes does in a pasty or mud like mass of little consistency, it is dragged or scraped out to firm land, and upon evaporation of the contained water it forms an article of fuel considered even superior to that produced from an ordinary bog. Air dried peat from a good bog, properly cut and saved, is by no means a despic-

able article of fuel. There are those indeed who have used it in the old lands who do not hesitate to claim for it an equality with either coal or wood. Doubtless however one of its principal advantages to the poorer people of European or other countries is that it can be obtained at an expenditure of little more than their own labor. A family of growing boys with some assistance from the father or even the mother can easily secure a year's fuel at the cost of a few days' or weeks' work. The fact that (as in Scotland) where wages have risen and increased facilities of transport have made coal available, the latter is preferred to peat, shows that on the whole common air-dried peat is not to be compared with coal as a fuel.

Manufacture of Peat.

Methods of improving peat for fuel.

By various methods of manufacture however the crude article is very greatly improved and brought more nearly upon an equality with coal. The principal objections to air-dried peat are its bulkiness and the considerable percentage of water which it retains. One ton of coal is the equivalent in evaporative effect of several tons of common air-dried peat, and ordinary specimens of the latter even when considered dry and fit to use contain not less than 25 or 30 per cent. of water. The object of manufacture is therefore to reduce the peat in point of bulk and to free it from water. One method adopted to compass these ends has been tried by means of a great variety of mechanical appliances by inventors on the continent of Europe, in Great Britain and even in the United States. It consists essentially in reducing the peat as taken from the bog by grinding, triturating or macerating machinery to a pasty, pulp-like condition, after which it is spread out upon the surface of the ground, marked off into divisions of suitable size and allowed to dry. Sometimes the peat is moulded or pressed before being dried, sometimes air-dried before being compressed, and in some methods the drying is done by artificial heat. The result, especially when the drying is hastened by artificial means, is a hard dense fuel approaching or equal to coal in specific gravity, and capable of emitting intense heat. The cost however is considerable, and though occasionally especially favorable circumstances have conspired to render the experiment feasible and to enable the manufacture to be continued, sooner or later the expense has risen to a point beyond the returns, and failure has been inevitable.

The difficulty to be overcome.

Peat as it exists in the bog contains 90 per cent. and upwards of water, a large proportion of which it retains with the utmost tenacity, but all or nearly all of which must be got rid of in process of manufacture. To evaporate eight or nine tons of water in order to obtain one ton of fuel would on the face of it seem an impracticable undertaking, hence various plans have been attempted to overcome this difficulty.

Harrowing.

One is, after the living and (for fuel purposes) worthless growth on top of the bog has been removed and the bog drained, to pass a light harrow over the surface, after which the partially dry peat is collected and the process completed.

Pulping.

Compression of the crude peat whether by rollers or powerful presses has also been attempted, but in connection with the pulping process has not proven very successful, as the pulping is done with much more difficulty and requires much heavier machinery when the material is in a partially dry state. Indeed with some stiff, dense peats from the lower portion of deep bogs water has not infrequently to be added in order to effect a reduction to the necessary paste-like condition.

Compressing and drying by artificial heat.

Another system of manufacture is one in which the peat is passed through compressing machinery at the beginning of the operation, and without being pulped or having its original fibre destroyed is dried by artificial heat and by strong pressure formed into blocks, cakes or cylinders of the desired size. The employment of artificial heat of course adds to the cost of the process,

but it is doubted by some whether the water contained in the peat can be wholly expelled or even eliminated to the required extent by pressure alone, and experience appears to bear out this view.

Improvement by charring or coking.

Peat is used not only in its ordinary form, but like wood and coal may be carbonized and reduced to coke or charcoal. Containing a percentage of carbon in proportion to its weight intermediate between that of wood and coal, it gives on carbonization a corresponding weight of charcoal. Wood yields about 22 to 27 per cent. of charcoal and coal 75 to 90 per cent., while peat gives about 23 to 35 per cent The condensed peat produced by the pulping process gives a much harder and denser charcoal than the ordinary air-dried article, the charcoal from which is so friable and light that it cannot be used in metallurgical operations. Peat charcoal has this advantage in common with wood charcoal over coke from coal, that it is much freer from impurities, such as sulphur and phosphorus, which exercise so injurious an effect in the smelting or refining of iron. These and other impurities however are not unknown in peat, and their absence or presence is usually dependent upon the constituents of the rocks and soil surrounding the bog from which the peat is taken. The decomposition of gypsiferous or pyritous rocks in the neighborhood of a peat bog would, for example, be sufficient to account for the presence of sulphur in the ashes of peat fuel manufactured from it. A bog in Wales containing copper pyrites was long used for the production of peat which was burned for the sake of the resulting ashes, many thousands of pounds' worth of copper having been extracted therefrom. Peat usually yields more ash from a corresponding weight than wood and about the same as coal, but it varies greatly in this respect with the composition of the bog from which it is taken. Sand, lime and other similar substances are generally found in the ashes of peat, either in chemical combination or mechanical mixture, having in most cases been derived from the surrounding soil.

Processes Under Way.

Slow progress in the manufacture of peat.

As might have been expected, much more effort has been made to produce a good article of peat fuel economically in European countries than in the United States, where there is a comparative abundance of coal. In the latter country about twenty-five or thirty years ago coal was even higher in price than it is at present, and much attention was directed to the utilization of peat, without however any lasting result. In Canada on the other hand the fuel problem has been more pressing, and at various periods processes have been in actual operation for the manufacture of peat fuel for a longer or shorter time. Recent events seem to indicate a revival of the interest in this question, for at the present moment there are three or four processes under way by which their inventors hope to solve the perplexing problem. In the neighborhood of Montreal and elsewhere in the Province of Quebec probably more persistent attempts have been made in this direction than anywhere else in Canada.

The Hodges.

Nearly thirty years ago Hodges placed his pulping machinery on a scow and manufactured peat at Bulstrode, at we are informed a cost of 92 cents per ton, and large quantities were consumed as fuel for the locomotive engines of the Grand Trunk railway.

Aubin-Hally, Aikman and Dickson processes.

A somewhat similar process invented by N. Aubin and improved by James Hally was at work for a time under the management of the Valleyfield Peat Company, while David Aikman of Montreal for many years has been experimenting and is still experimenting with the process of manufacture which bears his name. A. A. Dickson of the same city has invented a process somewhat different in principle from any of these, which he believes is now perfected, and which the company he has formed intend to have in operation this coming summer in a bog on the Welland canal, where they have purchased a tract 3,000 acres in extent. I have here specimens of Aikman's, Hally's and Dickson's peat fuels, as well as samples taken by myself from a small bog near Berlin, Ontario. The last named

sample is of the ordinary air-dried kind, and being taken from the bottom of the bog shows the deposit of shell marl underlying the bed of peat. Specimens of Aikman's and Dickson's manufacture corresponding to these have been submitted to Prof. Ellis of the School of Practical Science, Toronto, for examination. He has tested them in a Thompson calorimeter with the following result:

A calorimetic test of manufactured peats,

	Aikman peat.	Dickson peat.
Moisture	7.4	10.2
Ash	19.5	2.9
Heating Power	5115 units.	5280 units.

Three samples of standard kinds of bituminous coal were also submitted to Prof. Ellis for purposes of comparison, which gave in heating power as follows:

and bituminous coal

	Units.
Hocking coal, Ohio	6,820.
Masillon coal, Ohio	7,425.
Reynoldsville coal, Pennsylvania	7,480.
Mean—	7,241.

The heating power is expressed in metric heat units.

It will be seen that the two specimens of peat are nearly alike in heating power, and that in this respect they stand respectively in the relation of 71 and 73 per cent. of the mean value of the samples of coal. The average price of Reynoldsville coal at Toronto, where it is said to have control of the market for heating purposes, is $4.25 per ton, so that on the basis of calorific value alone these peats would appear to be worth about $3 or $3.10 per ton. The percentage of moisture does not materially differ in the two samples, being 7.4 and 10.2 respectively, and it is probable that experience would show the inutility of going to the trouble and expense of reducing the contained water below the smaller of those figures, as on exposure to the atmosphere the absorbent qualities of the peat would doubtless be sufficient to restore the percentage of water to at least this point. The greatest difference between the samples is in the matter of ash, in respect of which there is a marked inequality, one sample showing 19.5 and the other 2 9 per cent. This is of course due entirely to the composition of the bogs from which the samples were made, and has no bearing upon the merits of the processes of manufacture themselves. If the crude peat contain a considerable proportion of incombustible matter no amount of trituration, compression or other subsequent treatment will lessen it, and the plain inference is that in the manufacture of peat fuel only those bogs should be employed which careful experiment shows to be reasonably free from inorganic substances. The proportion of ash contained in the more impure of the two samples, 19.5, is so high as to seriously detract from its value as fuel, and would lead to the conclusion that the bog from which it was made is not well suited for the manfacture of the article.

Comparative merits.

Ash.

Peat Fuel for Metallurgical Operations.

A recent letter from England gives an account of a process by which Mr. J. D. Brunton of London is attempting to utilize the peat of Dartmoor in the production of pig iron from hematite ore, of which abundant supplies exist in that district. He proposes to use by a happy reciprocity the waste gases from the blast furnaces to dry the peat, and the peat, apparently without being charred, to smelt the iron. It is estimated that 200 tons of peat will suffice for a yield of 100 tons of pig iron per week. The cost of iron ore is put at from 3s. to 6s. 6d. per ton, and the cost of the pig iron made under these conditions after ample allowance for contingencies at £2 15s. per ton. If the selling price of the iron be put at only £5 per ton (a low price for charcoal iron) a profit of £2 5s. is expected to be realized. A square mile of the Dartmoor peat ground is said to be sufficient to supply fuel for a make of 100 tons of pig iron per week for 100 years.

A new English process of manufacturing peat for blast furnace fuel.

The application of the hot gaseous products of blast and other furnaces to the dessication of peat is not however original with Mr. Brunton. On the continent of Europe kilns for drying peat have been constructed in which the hot waste-gas of furnaces is driven in through the roof by means of a fan, made to descend through the peat, and thence to pass into a chimney communicating with the interior of the kiln at the bottom by two flues, one on each side. Kilns on this principle are said to have been first introduced by Schlägel into Austrian smelting-works, and extensively adopted, especially in French smelting-works. The distinguished Swedish iron master Gustav Ekman in 1856 erected a peat kiln upon this principle with, it is reported, an entirely favorable result. Ekman heated his kiln with the waste gas of a charcoal finery, which gas after having been used for heating pig iron, the blast of the finery and an annealing furnace, was admitted into the kiln. Kilns constructed on the principle of taking in the hot gas at the top are said to dry the peat more equally and quickly than those in which the gas enters at the bottom.

Peat kilns in Europe.

Peat and peat charcoal are used to some extent in the smelting and refining of iron in European countries, but where, as in Great Britain, mineral coal and coke are abundant the latter are more generally employed. Dr. Percy, after a somewhat exhaustive review of the subject in his work on Fuel, gives it as his opinion that "by a judicious selection of peat and suitable treatment peat charcoal might, so far as relates to its capability of producing heat, serve as an efficient fuel for metallurgical operations." He adds that "the use of peat charcoal for fuel must in great measure depend upon the cost of its production, inclusive of the cost of the original peat, and its capability of competing in that respect with other fuel, namely, wood-charcoal, certain kinds of coal and coke." The widest field of usefulness for peat in metallurgical processes would appear to be as material for the production of gas for use in the so-called regenerative furnace invented by the brothers Siemens, which has come so largely into use for smelting and refining purposes. To quote Percy again: "Experience on the continent has conclusively shown that peat-charcoal may be used in some metallurgical operations with success; also that peat may be successfully used for the production of gaseous fuel in a gas-producer. Mr. C. W. Siemens indeed has informed me that putting its cost aside he should even *prefer* peat to coal for use in the producers of the regenerative gas-furnace. Now the metallurgical operations to which gaseous fuel has been applied are already numerous, and it seems capable of even much wider application. The drawback in the employment of peat when high temperatures are required, resulting from its containing a large quantity of water, is obviated by converting it into gaseous fuel, and subsequently condensing the moisture contained in the latter. So far therefore as the suitability of peat for metallurgical purposes is concerned, we may not unreasonably conclude that it could be widely substituted for coal with success." Percy goes on to state his conviction that peat can only compete with coal in countries where the cost of production and carriage of peat is relatively very low and the price of coal relatively very high, and that as regards Great Britain circumstances must greatly change before these favorable conditions for utilizing peat are fulfilled.

Utility of peat fuel in metallurgical operations.

Percy's conviction as regards Great Britain is doubtless well founded, but the state of things in Ontario and Quebec is vastly different from that in the mother land. The pregnant fact that while there is abundance of coal in England there is none at all here changes the situation entirely, and conclusions which may be justly arrived at in the case of Great Britain are altogether inapplicable in our own. The cost of carriage which in England would be greater upon peat than coal is here decidedly in favor of peat. Our only supplies of coal lying either a long way to the south in another country, or a long way to the east in another Province, the item of freight

The situation in Ontario and Quebec.

charges must always be a heavy one and must continue to add largely to the cost of the coal used here, while on the other hand once a really practical and economic system of manufacture was introduced the peat bogs which are found in all quarters of Ontario and Quebec might be made sources of fuel supply to surrounding districts at a minimum cost so far as freight charges are concerned.

Peat Areas in Ontario.

There are very large areas of peat in Ontario. Mr. E. B. Borron, who has penetrated through the wastes of the Hudson Bay slope, tells us that in his opinion there are 10,000 square miles overlaid with peat from six to twenty feet in depth in that part of the province. In the district between the Ottawa and the St. Lawrence rivers, in the vicinity of lake St. Clair, in Elgin county, in Parry Sound district, in Waterloo county, in Welland county along the Welland canal, in the counties of York and Simcoe, along the line of the Canadian Pacific Railway west of lake Nipissing, and in many other sections of the Province are peat bogs of large area, and were they to become valuable as a result of a perfected process of manufacturing peat fuel the existence of many others would no doubt be revealed.

Localities where peat deposits are found in great abundance.

A storehouse of great value.

Peat fuel has been successfully employed for all the purposes for which coal and wood can be used. For some of these purposes it is, owing to its bulk, less adapted than coal, as for instance in steamer and locomotive boilers, where economy of space is a great object, while for others, as we have seen, it is a very efficient substitute. Even in the production of illuminating gas it has been employed with good results, as for example in Dartmoor, England, where the prison at Prince Town is or was lighted with gas made from peat.

In conclusion, I have only to express my conviction that this problem of the utilization of peat for fuel is one of the most important and pressing of the economic questions which are today engaging the attention of the people of Ontario and Quebec. Though the difficulties which lie in the way of its solution have proven themselves to be many and formidable, the ingenuity of man is, I am convinced, equal to the task of overcoming them. I cannot think that the quest after a good cheap peat fuel is the chase of an *ignis fatuus*, but on the contrary I cherish the hope that ere long we shall see a process in successful operation which will utilize our own resources, give us a first-class fuel at a cost below that of coal, and deliver us from the yoke of a foreign monopoly.

when the problem of treatment is solved.

DISCUSSION ON THE PAPERS.

Discussion upon the papers was invited, and Mr. A. A. Dickson, who was present, and whose method of manufacturing compressed peat fuel was described in the Report of the Bureau of Mines for 1891, was asked to speak.

Mr. Dickson said he had little to add to what had already been said, except to say that the company which he had organized had secured a bog on the Welland canal about 3,000 acres in extent, and were having the necessary plant constructed for manufacturing the fuel. The blocks which had been exhibited as of his manufacture were merely small samples. It was the intention of the company to make the fuel in at least two sizes, one in blocks about 3 inches long and 3 inches in diameter for steam generating purposes, and the other for domestic use in blocks about 2 inches in diameter. In his process as perfected the moisture is driven off solely by compression, artificial heat not being required, and not more than 10 per cent. of water is left in the manufactured article. They found the quality of the peat in the Welland bog to be excellent, and the upper portion after the moss is removed to be nearly as good for fuel purposes as the lower, the samples shown having been made from it.

Erecting works to manufacture peat fuel on the Welland canal.

Mr. B. T. A. Bell asked Mr. Dickson at what price he thought he could place his fuel on the market.

Mr. Dickson replied that it would have to be sold at a lower figure than coal. The cost of manufacturing would be about $1.50 per ton.

Resistance to moisture.

Mr. Th. Doucet inquired whether samples of Mr. Dickson's peat such as those exhibited had ever been subjected to water, and with what result.

Mr. Dickson said the peat was proof against moisture under ordinary circumstances, but if immersed in water for some time it would absorb a certain percentage. The samples shown were made from the Champlain bog, in Quebec.[1]

Mr. Doucet wished to know if the samples of Hally peat shown by Mr. Gibson had been subjected to compression.

Mr. Gibson : No, it has simply been pulped and dried by evaporation in the open air.

Peat in Prince Edward Island.

Prof. Harrington (McGill College) stated he had had some experience with peat some years ago. The best peat he had ever seen came from Prince Edward Island, where there are large deposits along the seashore from which the peat could be loaded directly into schooners. They had been told that great care must be exercised in selecting the material, and this was a very important point. Many of the peats which had passed through his hands had not been chosen with sufficient care, having run too high in ash. The suitability of peat for smelting purposes had also been spoken of, and it was sometimes alleged that iron could be made with it better than with coal. He had always understood that while free from sulphur the ash of peat was frequently high in phosphorus, which would be a serious objection to its use in smelting iron. He had no definite statistics on the point however, and it would be an interesting one to investigate. It was also to be borne in mind that if peat were made into coke a large quantity of volatile matter would be driven off, and a peat that gave say 5 per cent. of ash would yield a coke containing perhaps 15 per cent. of ash, which again showed the necessity for a careful selection of material to be treated.

Care in selection of material.

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[1] Mr. Dickson furnishes the following particulars of a comparative test of his fuel and anthracite coal made at the John Abell engine works, Toronto :

Dickson's compressed peat, weight 457½ lb ; date of test, 13th December, 1892. Temperature in boiler house, 69°, outside, 39°, of feed-water, 122°; weather dull. At 1.34 the first peat was put in with a full fire of red coal, say 6 inches deep on the grates. Steam at 85 lb. pressure, with 9 inches of water in the gauge-glass. In six minutes the steam rose to 86 lb., at which point it remained for three minutes ; it was then kept steadily at 85 lb. during the whole time of the test, the pointer only vibrating sufficiently to show the line on each side alternately. At 3.34 the steam pressure began to go down, when firing was resumed with the regular fuel. Immediately before commencing the test the boiler-tubes, ashpit and furnace were cleaned out. At the conclusion of the test the water stood at 9 inches in the glass, where it had been kept without varying during the whole of the time. Duration of test, 2 hours.

Large anthracite coal (egg), weight, 457½ lb. Date of test, 15th December, 1892. Temperature in boiler-house, 82°, outside, 31°, of feed-water, 121°; weather bright and sun shining. At 1.40 commenced firing with the test fuel with 9 inches of water in the gauge-glass. Steam at 85 lb., the fire, as nearly as could be judged, being the same as in the previous test. The steam remained steady at this pressure, with no more variation than that recorded in the other test, until 3.46½, when it began to go down, and firing with the usual fuel was resumed. At the conclusion of the test the water stood at 9 inches in the glass, being kept there steadily the whole time. As in the test with peat, the grates, boiler-tubes and ashpit had been cleaned out. The work on the engine was the same in both cases. Duration of test, 2 hours 6½ minutes.

Commenting upon these experiments, Mr. Dickson says : The test was made on a coal-burning grate, which is not quite suitable for the burning of peat, inasmuch as the surface is entirely too large. The temperature of the boiler-house when the peat was used stood at 69° above zero ; when the coal was used it stood at 82° above, making a difference in favor of coal of 13 degrees. When the peat was used the weather was dull ; when the coal was used the weather was bright and the sun was shining—a very material difference in favor of the coal, as those familiar with steam know. Notwithstanding this, 457½ lb. of compressed peat kept the steam steadily at 85 lb. for exactly two hours, while an equal weight of coal kept up the same pressure for only six and one-half minutes longer. Under similar conditions as to temperature and with a proper type of grate, peat would have done as well as the anthracite coal, if not better.

PEAT IN EUROPE TODAY.

Probably the most recent information obtainable as to the uses of peat in the various countries of continental Europe at the present time is to be found in the consular reports made to Her Majesty's Government on the subject and laid before both Houses of Parliament in March, 1893. These reports were made in pursuance of instructions given by Lord Salisbury to Her Majesty's representatives at The Hague, St. Petersburg, Stockholm, Copenhagen, Berlin and Paris to forward such information as they might be able to procure with regard to the manufacture of fuel, moss litter and other products from peat in the various countries to which they were accredited. These reports show in general that peat is still an important article of fuel in those parts of Europe where, owing to lack of coal, distance from seaports or proximity to peatbogs, it can be obtained at a less cost than coal. Other uses of peat and peat products, particularly as moss litter and in the conversion of sewage products, are also becoming more and more important, and in view of the comparative cheapness of coal in many parts of Europe it is probable that the utilization of peat will develop more rapidly there for such purposes than for that of fuel only. Moss litter is being manufactured in nearly every country in Europe. It is coming rapidly into favor as material for bedding horses, cattle, etc., one great recommendation being its capacity of absorbing moisture to many times its own weight. Considerable quantities are exported from Europe to Great Britain and also to the United States.

British consular reports on uses of peat

DENMARK.

Sir H. G. Macdonell reports that all the different modes invented during the past forty years for the treatment of peat have been tried in Denmark, and have been given up as impracticable, unprofitable, or both. Expensive experiments have been carried on at Silkeborg and Moseland within recent years, but with no appreciable results. In fact peat may be said to be used merely for fuel, the people cutting sufficient for their own consumption. In some of the inland towns in close proximity to larger moors there still exists a certain demand for peat, but at seaports it seems never to have been able to compete with coal, the specific heating power being too low as compared with that of coal to enable the peat to pay expenses connected with transport to any distance. Peat for fuel is either simply cut and dried, undergoing no further treatment ('skoretorv') or it is kneaded together, and subsequently cut into regular shapes for fuel, called 'oltetorv.' In this latter shape, as in the former, it does not pay the cost of transport to any distance. To the north of the Limfjord at Lundergaard Mose, the Aalborg Mosstroelsefabrik formerly employed some fifty to seventy men in cutting peat, which was used by the railway authorities for heating their carriages. This method of heating having now given place to steam, the occupation has ceased, and a moss litter factory has taken its place.

All invented modes of treatment abandoned.

Moss litter and

The following account is given of the way in which moss litter is used in the stables of the Copenhagen Milk Supply Company:

"Each stall is constructed with a hollow lined with cement three inches deep below the level of the floor paving. This is filled with the litter. About an inch in depth is removed daily from the surface, the fresh supply being laid at the manger end, while the supply of the day before is raked from the head to the hinder end. The litter so removed forms most excellent manure. The peat-moss litter is delivered in compressed bales of 150 lb. each, and care must be taken that it should be almost free from any moisture in order that it may be able better to absorb all moisture when in use. The company in question keep fifty horses. Though it is customary in Denmark to take but little care in grooming horses and keeping stables clean, and though there is no drain whatever in the stable in question, no trace of ammonia and hardly any unpleasant smell could be detected. The manager, Herr Busck, informed

me that the litter for the fifty horses cost the company £100 a year, or £2 a horse per annum. The use of this article, for sanitary and economical reasons, in large towns and for cavalry barracks, cannot be overestimated, and since the same quality of peat exists in Great Britain, this industry should certainly be capable of great development."

Its commercial and sanitary values.

FRANCE.

The Marquis of Dufferin reports briefly that it appears the peat industry does not exist to any appreciable extent in the consular districts of Brest and Cherbourg; a small quantity of peat is cut for the purposes of fuel, and in that of Marseilles turf is also used for burning in the neighborhood of Lyons, but there appears to be no appreciable commerce. In the district of Calais, again, it is reported that there is no manufacture of moss litter from peat, while the quantity cut by the peasantry has been for many years on the decrease, and in 1890 573 cubic metres only were cut at Condette and in the district of Montreuil, some 5,000 cubic metres in seventeen communes, while though there are peat bogs in the Department of the Nord, no turf was cut in 1889 or in 1890. A small quantity is also cut in the Department of the Somme As regards southwestern France, Mr. Consul Ward reports that there are peat bogs of more or less limited extent in all the Departments forming the consular district of Bordeaux from which peat is extracted for fuel, but the production is confined to local consumption. In the district of the Charente some 7,000 tons are cut annually, but the amount is far less than in former times. But the only use to which the peat is applied on the spot is for fuel. The Bordeaux Tramway Company, which tried the experiment of peat moss for litter, has now abandoned the use of it, partly because of the difficulty of disposing of the manure, and partly because the litter, which was sold to them by weight, was frequently supplied in a damp condition, which considerably reduced its utility. In Paris there are four or five firms which supply peat for fuel. There is however one important enterprise, the company known as La Beraudine, founded by M. Beraud for working his patents and manufacturing a number of articles from peat fibre, including litter, disinfecting media, blankets, carpets and rugs, mattresses, antiseptic food, preserving material, manure, etc.

Small quantities produced,

and are confined to local consumption.

Manufactures from peat fibre.

In a supplementary note it is added that this Company supplies about eight different articles to the French Government, chiefly mattresses, blankets, saddle-cloths, etc., but that the number of articles manufactured from the fibre obtained by M. Beraud's process is very great, and comprises nearly all those in which felt has hitherto been used, with this important difference, that the articles are made from a woven fabric and not from a brittle material like felt.

GERMANY.

Sir E. Malet forwards a report containing much information, from which the following extracts are made:

The area covered by peat bogs ('torfmoore') in Germany is very extensive, especially in the northern provinces of Prussia and the grand duchy of Oldenburg, but a small part only of this area is Government property, and no statistics of any sort are available as to the actual acreage and production. Almost all these moors are worked locally for fuel peat, and the manufacture of moss litter is also very widely spread, being carried on in East Prussia, Pomerania, Posen, Silesia, Hanover, Oldenburg, Wurtemberg, Saxony and Bavaria. The peat bogs belonging to state domains in Prussia, of which a larger number exist, are generally worked by the Government Forest Department; many of them however are let for a term of years to private individuals, the lease being usually made out for thirty years or more, and the tenant having the right and in some cases assum-

Peat bogs worked for fuel and moss litter.

ing the obligation of removing all the peat during that time, thus preparing the land for agricultural development. An important moor under state management, and within a short distance of Berlin, is that of Carolinenhorst, near Stettin. It covers an area of about 2,000 acres, and is administered by the Finance Department of the Government of Stettin. Even in this case however although the peat cut for fuel is sold by the state authorities, the manufactory of moss litter is let to a private *entrepreneur*. A notable private undertaking of the kind is that of Herr Rottbarth at Gifhorn in the Province of Hanover, where both peat fuel and moss litter are produced on an extensive scale. . . . The principal products obtained from peat are:—(1) Fuel, including turf coal and turf coke. (2) Moss litter. (3) Peat dust ('torfmull') for disinfecting purposes. (4) Coarse textile fabrics, paper and various chemical products.

The use of peat as fuel is universal in the neighborhood of the moors, but is generally local. It cannot compete with coal for cheapness in any districts near the seaports or near towns which have railway communication. Peat for fuel cannot pay railway freight for more than twenty miles from the place where it is cut, and very little is ever conveyed by rail. The rate charged is about 9s. per load of 9,600 sods of peat for 10 miles. There are no available statistics either in Prussia or the other peat-producing states as to the amount consumed, but considering the wide distribution of peat bogs throughout the country it is probably very great. It is estimated, for instance, that in the grand duchy of Oldenburg alone about 150,000 tons of peat are burnt per annum, chiefly for household purposes, but also in baking ovens, brick-kilns, etc. . . . No machines are used on the Government moors in Pomerania for cutting fuel peat, but they have been employed on private moors where labor is scarce. The cost of production is not sensibly reduced by machine-cutting. The best peat for burning is generally that which lies undermost, the upper layer, to a depth of 4 ft. 6 in., being used (where it is of suitable quality) for moss litter; all beneath that depth for burning. At Carolinenhorst the peat is always dried in the open air, all other methods having proved too expensive. An attempt was made at Gifhorn to dry the peat artificially in an apparatus invented by Herr Rottbarth, but as the system was abandoned after a very short trial it appears not to have been a success. . . . The first class is the dark peat, approaching to coal, which is usually cut from the lowest stratum, and is heaviest. It shrinks most in the process of drying, a fresh sod measuring when cut 13 inches in length by 10 inches high and broad. This class of peat burns slowly, and when fifteen sods are burned in a closed stove they will leave about a large wineglass full of white ash. The second class is lighter in color and weight, and is a newer formation. The third class is the top stratum, and is of least value except in those cases where it is suitable for the manufacture of moss litter. These lower classes of peat leave more ash in burning. In some places these differences in the quality of the peat taken from the top or the bottom of the stratum do not occur, the moss being uniform throughout. The peat is sold by auction (at Carolinenhorst) and fetches as a rule: 1st class, 14s. per 'klafter' of 1,200 sods, 2nd class 10s., 3rd class 8s. The moor at Carolinenhorst employs about 500 men and women for cutting and stacking peat, chiefly for fuel. The average amount earned by a man at this work is from 4s. to 4s. 6d. per day, but they are paid according to the amount cut. The women are paid about 3½d. for every cubic metre stacked. . . . The best material for the production of moss litter is formed by the upper strata of the 'hochmoore' (high bogs) which cover considerable areas in Hanover, Oldenburg, East and West Prussia and Pomerania. The natural vegetation of these bogs consists of moss, together with various grasses and heather (Eriphorum, Calluna vulgaris, Erica tetralix, Andromeda, Ledum, Empetrum, Vaccinium and Sphagnum cymbifolium). The decom-

Peat used for fuel chiefly near the place of production.

Qualities peat.

Employment of labor.

Best material for litter.

posed remains of these plants form a dark soil overlying the yellowish-brown layers of moss peat which often attain a thickness of several yards, and in their turn overlie the older and darker peat which is used as fuel. The characteristic of the strata suitable for the production of moss litter is that in them the process of decomposition is incomplete, and that they form an extremely porous and elastic substance, which is capable of absorbing water like a sponge. In the process of drying this material contracts very little, and consequently remains soft and elastic. . .

Process of manufacturing litter.

The outlines of Hollman's system of manufacturing moss litter are briefly as follows: The moss peat is cut out of the bog in sods in precisely the same manner as fuel peat. The autumn and early winter are chosen for this work so as to allow the moss peat to freeze before drying. It is dried in stacks in the open air. At Carolinenhorst about 6½ acres, 58 inches deep, are cut each season, and yield about 3,000 tons of moss litter. The sods when dry are taken to the factory, placed in elevators and carried to a machine called the 'wolf,' which tears them into small fragments. The moss thus produced is passed over sieves to separate the peat dust ('mull') from the fibrous substance which forms the litter. It is then brought into a press which (in the case of Carolinenhorst) is 10 feet high by 2½ feet square. The pressure employed is about four horse power, and six cubic feet of the loose material are pressed into a space of two cubic feet, being then baled with six to ten laths of wood and bound round with iron wire. It is then ready for the market, and is valued at 1s. per cwt. at the railway station. The moss litter factory on the Carolinenhorst moor employs fourteen to sixteen hands, of whom one-third are women, the working day being ten hours. An adult workman is paid about 2½d. per hour, a young man 2d., and a woman 1½d

Merits of the litter,

. . . It is claimed for moss litter that (1) it affords drier and healthier bedding for horses and cattle than any other material, (2) that in consequence of its great power of absorbing moisture it binds the valuable portion of the animal excrements and consequently yields the best manure, (3) that it acts as a disinfectant and improves the air of the stable, (4) that a smaller quantity of it is required than would be needed if straw were used. The published results of experiments and longer experience in the use of moss litter are not entirely consistent. In general however they are favorable, especially where horses and horned cattle are concerned; and cases of sickness consequent upon its use can be traced as a rule to negligence or the use of damp litter. The following is an extract of a report on the use of moss litter in the stables of the Prussian regiment of Uhlans (Lancers) No. 14, which

as shown by practical test.

seems entirely favorable: The regiment has used moss litter as a substitute for straw with the object of obtaining better and drier beds for the horses and reserving the fresh straw for food. This object was attained with complete success. For experimental reasons the horses were not all placed on moss litter at once. In October one-third were placed on moss litter. In November two-thirds were placed on moss litter. In December nearly all were placed on moss litter. The following advantages were observed: Dry beds and dry fresh air free from ammonia; the ceilings, walls and leather trappings remained free from moisture and mould. Moss litter absorbs eight times its own weight of urine, whereas straw absorbs only three times its own weight. The short and broken nature of the moss fibre allows of the easy removal of the wet portions. Care must be taken not to neglect to turn and shake up the litter every day and to fork it from one part of the stall to another. If these precautions are observed the animals find a dry bed, the horses remain clean and their skin in activity. If properly treated, moss litter is far more elastic than straw and affords a more comfortable bedding. The harness and saddles, as well as the boots of our soldiers are better preserved. From a veterinary point of view further advantages are observed. Catarrhs of the nose and eyes, generally the result

of bad air in the stables, are less frequent; wounds on the legs heal quicker; inflammation of the glands very seldom occurs, and rotting of the frog is almost entirely prevented. In cases of contagious diseases moss litter is of great value and surpasses all other disinfectants.

The smaller particles which are separated from moss peat when it passes through the 'wolf' and the sieves used in the manufacture of moss litter, are collected and reduced to a powder known as 'torfmull.' This product has obtained a market for various purposes, and sells at about 1s. 3d. per cwt. It is used, according to the report, as a disinfectant, as a material for making antiseptic bandages, in absorbing the lye resulting from the treatment of molasses with strontium in sugar factories, as an admixture with salts used in powder as chemical manure, and as packing material for breakable or perishable goods.

Apart from the use of peat as fuel and in the shape of moss litter, its employment as raw material in other branches of industrial enterprise is in its infancy. Its utilization has been attempted in the following ways: A substance consisting of a mixture of peat dust, India-rubber, and sulphur has been found to be excellent material for isolating subterranean electric cables. Good porous bricks are manufactured at small expense by mixing the clay with peat dust. Pure moss-peat mull, free from admixture of grass peat or particles of sand, has been used for some time in the manufacture of gunpowder to replace charcoal. Peat fibre carefully freed from dust is beginning to be used as a material for carpets and other coarse textile fabrics The fibre is also used as raw material in some paper-mills and manufactories of celluloid. The chemical industries are likewise attempting to make use of this promising material, and gas for lighting purposes, tar, parraffin, solar oil, photogen, etc., have been manufactured from it. Matches have also been made of peat fibre instead of wood.

Uses of peat in industrial enterprises.

THE NETHERLANDS.

Mr. Consul Turing of Rotterdam gives an account of the manner in which the so-called short or dredged turf is produced on the low-level moors. This is obtained by dredging with a kind of scoop, when a black and soft substance is brought forth which is spread out to a depth of five to six inches on a flooring of boards, and is then trodden down by laborers with specially adapted wooden shoes with the object of obtaining one adhesive mass. This is subsequently cut through crossways with a spade, each portion having the form of a turf, and the whole mass is then left exposed to wind and weather until the turfs have arrived at a sufficiently dry and hard state to allow of their being handled, when they are stacked in long rows to a height of 2 to 3 feet. The exposure to the sun and wind results in their drying up entirely and attaining the necessary hardness. They are then collected and stacked in large heaps with a covering of reeds, and are subsequen ly brought to market. This kind of turf is exclusively used for domestic purposes. Numbers of skippers with their barges proceed throughout the year to the moors in the northern provinces, where they buy the turf for subsequent retail sale in the towns and villages.

Curing of dredged turf.

The production of peat moss has been carried on in the Netherlands for only about ten years, and in no other country has it assumed such dimensions. It is produced on the high-level moors, the upper portion of the bog or gray turf being used for the purpose.

"The 'fine' litter is used for mixing with sewage, and a mixture of equal quantities produces a dry, dark, earthy substance, which can be turned over with a spade and is entirely inodorous. As a manure this product is quite as valuable as the stable moss litter; but whilst the latter in its original state is extensively used in all European countries and also in America, the mixture of 'fine' peat with sewage is but little known, although in some cities such as

Mixing 'fine' peat with sewage for manure.

Bremen, Brunswick and Oldenburg the product is largely used by the authorities. In Gothenburg, in Sweden, the 'fine' peat has been utilized for a number of years, whilst in Belgium a company has been formed for the purpose of collecting the sewage of the several towns and mixing it with moss litter and thus producing a merchantable article. Initiatory steps have been taken in Bruges and Mons, and the company will soon commence in other towns. Although the special advantages attaching to the mixture of the litter and sewage appear to be so little recognized as yet, nevertheless we think that through this industry the gray turf moors have a great future before them. In 1889 the value of one hectare (fully 2 acres) of this kind of moor was £100, whilst only ten years previously the gray turf being considered valueless, was ruthlessly cut up and thrown away, the only object being to get at the sub-strata of black turf."

Factory turf as fuel for firing brick kilns.

We now come to the subject of black turf, or as it is usually called by the trade factory turf, from its being almost exclusively used in the brick kilns along the rivers Maas, Waal, Linge, Lek and Yssel. This turf is dug up in the same manner as the gray, but care must be taken to dig only when there is no fear of frost, and also to stop digging in time to allow the turf to be quite dry before the frost sets in. The period for digging the black turf lasts therefore only from the 15th March to 15th June, whilst the gray can be worked throughout the whole year except when the soil is too hard through frost. If black turf is frozen before having dried it loses its heating power and consequently its value as a merchantable article, and then it is sold at a very low price for domestic purposes. The factory turf is conveyed in barges to the brick kilns. The importance of the trade in this article may be gathered from the fact that in the Netherlands about 280,000 tons weight are annually consumed in the manufacture of bricks, of a value of £133,000, of which £100,000 represents labor and freight. The value of one hectare good and favorably situated black peat may safely be taken at £170.

Natural turf.

Mr. Consul Robinson of Amsterdam speaks of the natural turf which has undergone no preparation save cutting from the bog and drying in the air, as having all the inconvenience and undesirability of a spongy fuel and as being unpopular as such. Hand labor is used in cutting where the bog has already been well drained. Where this is not the case cutting machines have to be used, one of the best known of which is the Victoria turf cutter manufactured by Brosowsky of Stettin, Grunhof. The natural turf is much inferior to the machine-made article, the substance of which is densified by various processes.

Pressed, washed and sifted turfs.

"The turf mass is either first disintegrated and dried in ovens and then pressed into moulds, or treated by the wet press process fresh from the peat bog (Koch and Mannhardt's system), and in this way pressed turf is obtained. Washed turf is produced by the Challeton system by passing the raw peat through rollers with knives; it is then driven by means of brushes through a fine sieve and then mixed with water, forming a pulp which is placed in casks in which the mineral and earthy parts sink to the bottom. The pulp is then dried in pans, and when sufficiently compact moulded in shapes. Sifted turf (Versmann's system) is obtained by placing the raw peat in an iron disintegrator, through which runs an axle with a serpentine knife. The finely-cut peat is squeezed out of the disintegrator through small holes, while the coarser parts pass through the bottom opening of the disintegrators. The expression 'machine-made turf' includes all those descriptions of turf in manufacturing which the fibre of the peat is cut by machinery and remixed in such a manner as to form as far as possible a homogeneous product, even where turf presses for condensing the same are not used. It may be assumed that nine cubic metres of fresh peat will produce six cubic metres of wet machine-made turf, that is seven (?) cubic metres of dry machine-made turf weighing 200 kilog. The specific gravity of air-dried, hand-cut

urf is on an average .2, that of the air-dried machine-made turf .6 to 1.3, according to the quality of the raw material. Air-dried machine-made turf contains up to 30 per cent. of water, and as this must be evaporated during combustion there is a considerable loss of heating power. In order to lessen this, drying ovens of various construction have been tried. Turf is also converted into charcoal in the same manner as wood, both in heaps and specially constructed ovens. Turf charcoal is nearly equal to wood charcoal in heating effect, but is not so useful as the latter, as on account of its porous nature and proportionately large residuum of ash the fire is less intense. . . Turf charcoal.

"The secret of the success and of the profitable working of the moors and bogs in Holland, and of the generally flourishing condition of her turf industry lies nearly altogether in cheap means of transit. All the principal turf-producing centres are intersected by canals capable of being navigated by the large turf-carrying lighters, from 80 to 200 tons dead weight capacity, and as the bog is opened out for turf cutting the canals are simultaneously pushed forward, so that the expense of transit at the place of production is reduced to a minimum. As regards the home consumption of turf, it is also so regulated as to do away with every manipulation of the article which can possibly be avoided. . . The expense of carriage to the port of shipment, even under the above favorable circumstances is 25 to 50 per cent. on the cost of production, and it is very clear that the article is one which cannot possibly bear any extra expense of manipulation or transport. The climate of this country, though more humid than that of most parts of the continent of Europe, is still sufficiently dry, especially in the early part of the year when lengthened periods of dry easterly winds prevail, to encourage the production of turf, while the consumption as a household fuel prevails so very generally over the whole of Holland that in spite of the competition of coal and coke it continues to hold its own in this respect. Besides this household consumption, the brick-making industry is the chief consumer of turf, which is transported by lighters direct from the bogs to the brick-making establishments, situated in great numbers along the principal rivers of Holland, where brick clay of an excellent quality is found. The consumption for this purpose is a very large one, the turf forming a clean, practical and economical fuel for brick-burners, whose ovens are specially arranged for its use." Profitableness of production depends on cheap means of transit.

RUSSIA.

According to Mr. Consul Michell at St. Petersburg, peat fit for fuel is found in Russia in forty-five of its provinces on an area which it is calculated extends over 100,000 square versts (67,000 square miles), and is capable of yielding 875 milliards of poods (14 milliards of tons) No exact information as to the quantity of peat cut in Russia is in existence. It can only generally be said that it is found in the provinces of Moscow, Vladimir, Nijni-Novgorod, Orel, Kharkoff, Kieff, Esthonia and St. Petersburg, where it is prepared as fuel for manufactories, sugar works and other industrial establishments, as also for locomotives. Among the peat bogs which belong to the crown those lying in the provinces of St Petersburg, Moscow, Orel, Riazan, Vladimir, Tamboff and along the Kursk-Kieff line have been surveyed. The result of the survey proves that the peat bogs of the crown in the above localities contain no less than 100 millions of cubic feet of peat of excellent quality. Some of these peat bogs are leased under the crown by private individuals, notably in the district of Pokrovsk, of the province of Vladimir, the lessees of which are Savva, Morozoff & Co., owners of the extensive Nikolsky cotton manufactory. Peat bogs belonging to private individuals are worked near the station of Orekkhova of the Nijni-Novgorod railway and in the neighborhood of Moscow, viz, at Krilobsky, nine miles west of that city; at the village of Nikolsky, along the high road leading to Extensive areas of peat in Russia.

St Petersburgh; near Gorenky station, on the Vladimir road, where it is worked for the Reutovsky cotton mill of the Morozoffs; near the station of Libertsi of the Riazan railway, in several parts of the provinces of Orel, and in the neighborhood of St. Petersburg.

Manufacture of compressed peat.

The peat used in Russia appears to be for the most part of the ordinary hand-cut, air-dried variety, but an account is given of establishments at Perst and at New Woidoma in which machinery of German manufacture is employed for the production of peat in a compressed form. These appear to be in successful and profitable operation, and it is stated that the working expenses of the establishment at Perst were almost completely covered in the first year.

Sweden and Norway.

Production and uses of moss litter.

Manufactories for the preparation of moss litter have been established in various parts of Sweden and Norway, and the value of peat mould (torfmull) as an antiseptic and for covering fæcal matter, which in Swedish towns is carted away solid, is being largely recognized. Mattresses and other articles of bedding are also manufactured from the peat fibre, as well as loose inside soles for boots and shoes. For surgical purposes and compresses the moss is chemically prepared with disinfectants.

Mr. Consul Duff of Gothenburg states that in his district peat is not yet used for industrial purposes on any extensive scale; some glass-works however having large tracts of peat in their immediate neighborhood have found it to their advantage to work the peat, and usually employ machinery of German construction for raising and shaping the material into a form of less bulk. Mixed with small coal it makes an excellent fuel. Also some iron-works use peat, but not largely; it is of course unmixed, and only used for certain purposes owing to its purity.

Mr. Duff also gives the following particulars respecting the manufacture and export of moss litter within his district:

Raising,

"By means of sharp spades the peat is cut into lumps about the size of a large brick, which are spread on the peat bog to dry. After some time these are gathered into small piles and placed so as to admit the access of the wind to take away all moisture.

housing.

"When the process of drying, which takes from a few months to a year, is completed the peat is collected and conveyed on portable rails to the barn, or placed in large stacks or piles to protect it as far as possible from rain.

manufacturing and

"The peat is now ready for the machinery, which in most cases is worked by steam. The lumps or bricks are brought in contact with a rotating wheel fitted with sharp steel pegs and are instantly torn to pieces, whereupon it is carried by an elevator to a large revolving screen where the separation of the two qualities of moss litter, namely, 'torfmull' and 'torfstro' takes place; the former being a soft substance similar to cigarette tobacco is used for closets, and the latter which is of the consistency of oakum is mostly used in stables and cowhouses

baling the litter.

"Powerful presses compress the litter into bales, which are held together by means of wire and wooden ribs. The size of the bale is 100 x 75 x 50 centimetres, and the weight about 100 to 120 kilog. The price is 20s. per ton free on board at Gothenburg.

Export trade.

"Although there are numerous enquiries for Swedish moss litter, particularly from Great Britain, still the export is very insignificant, owing principally to the high freights and the difficulty in reducing the weight of the litter.

"The average weight of the Swedish litter is 15 to 20 kilog. per hectolitre, whereas that of the Dutch litter, which in every respect is far superior to the Swedish, and of which a considerable import to Sweden takes place, is only 10 kilog. per hectolitre."

The following information on the present position of peat products in Sweden is given by Herr Th. Palmberg of Stockholm, his letter being dated August, 1892:

Great area of peat bogs in Sweden.

"The peat bogs of Sweden cover an immense surface, amounting to many millions of acres, nor are they confined to any one part of the kingdom, though the largest of them are either in the extreme northern provinces or in the provinces of Dalecarlia, Vermland, Smaland, Halland and North Scania. In Upper Noorland and in Lapland there are peat bogs hundreds of square miles in size, and consisting of turf of excellent quality; in other provinces the bogs have turf of different qualities, and occasionally different qualities of turf are met with in one and the same bog. The depth of the turf varies from 3 to 37 feet, and even more. It is an old custom in the southern provinces to burn turf as fuel in private dwellings; especially is this the case in provinces along the coast where there is no wood to spare for burning. To a certain moderate extent bogs were also formerly used for raising crops. But for the last thirty or forty years increasing attention has been paid to the profits attainable from Sweden's plentiful supply of peat bogs, both as regards their cultivation and as regards the fuel to be obtained from them for use in dwellings and in manufactories. During the last ten years increasing interest has also been evinced in the supply of peat litter.

A growing industry.

"To show the possibilities of their cultivation it may be mentioned that over 600,000 acres of bog have been brought into cultivation in the southern and central provinces during recent years. In these same provinces turf for burning is now cut out in enormous quantities every year by most of the iron-works and other industrial establishments situated inland and possessing bogs of their own.

Processes of the manufacture of peat.

"There are numerous ways of treating the turf (when cut) by machinery. There are different machines for disintegrating, rolling and pressing it, and making it hard after drying. The actual drying generally takes place on a flattened out piece of bog itself, either by spreading it out or putting it up on frames. Besides the above air-drying of the turf, several iron-works have of late years established ovens of various sorts for the further dessication of the turf. These ovens have in general given very good results. They are heated by the surplus heat of the furnaces, which thus costs nothing, and yet the turf gains from 25 to 30 per cent. in value from the process.

Curing with surplus heat of iron furnaces.

Peat fuel for dwelling houses and for industrial purposes.

"The ordinary turf for burning in dwelling houses in the southern provinces where wood is scarce is chiefly cut brick-shape by spades made for the purpose and then dried at the place where it is cut by simply spreading it out in small heaps. It costs very little to cut, but is rather loose owing to its being treated in so primitive a fashion. Such turf as is intended for industrial purposes is always worked up or disintegrated in one way or another, so as to be hard and solid when dried and thus give more heat when burnt. At iron-works turf is used in the furnaces either by itself or else mixed with coal and fir cones. At wood-pulp factories it is used for drying the pulp. Turf is also burnt in glass-works, brick-works, as fuel for steam engines, etc. It is only in the south of Sweden, and even there in but few cases, that there are factories for the preparation of turf for sale as fuel.

Increasing use of the fuel.

"It is impossible to give any exact figures as to the amount of prepared turf yearly produced in Sweden for burning, as no figures are recorded. Its use is increasing year by year owing to its being a cheaper fuel than coal. About 25,000 to 30,000 tons a year may be said to be employed in metallurgical works of different kinds.

Cost of production.

"The cost of producing well made turf for fuel may be given as from 4s. 4d. to 5s. 5d. per ton, according to the price of labor in different places. Good turf for fuel is expected to contain from 30 to 40 per cent. of heating material, and not above 7 to 10 per cent. of ash, and there is an enormous quantity of such turf in Sweden.

Peat litter factories.

"Of late years quite large quantities of peat litter has been prepared in southern and central Sweden, partly by twenty large peat-litter factories which produce it for sale, and partly by private owners of peat bogs who take it for their own use. It is of the very best quality, far excelling that produced in other countries. This peat litter is made from pure sphagnum, or immature moss unmixed with other sorts of moss. Each peat-litter factory makes about 15,000 to 30,000 bales (200 lb. each), and it is sold here in Sweden for about 1s. 8d. per bale. A much finer quality (called torfmull) sells for from 1s. 11d. to 2s. 2d. per bale."

XVI.

THE MINING LAWS OF ONTARIO.[1]

Ontario.

For three-quarters of a century Ontario was known as Upper Canada. For two-thirds of that period it had a Legislature and Executive of its own, and for the rest of the time it was united with Lower Canada, now Quebec. The union of the two Provinces ended with June, 1867, and on the first day of July Upper Canada became a member of the new Confederation with the name which it now bears. Three years before this date the first statute regarding Mines and Mining was enacted by the Legislature of the United Provinces, having for its title "The Gold Mining Act." This and the Amendment Act of 1865 were the only statutes which dealt with Mines and Mining down to the date of Confederation; all other control was exercised under the authority of Orders in Council and by reservations in the patent from the Crown. Under the latter provision gold, silver, copper, tin, lead, iron and coal were so reserved down to the end of 1823, and gold and silver until the 13th of July, 1866, when a regulation was approved by the Governor General in Council directing that in all letters patent for lands the clause reserving mines of gold and silver be omitted.

The first Mining Act.

Early control exercised by Orders in Council and reservations in the patent.

Evolution of the Law.

The necessity for exercise of Government control over mineral lands and mines arose in 1845, the first year of exploration and discovery on the north shore of lake Superior. At first each case requiring executive action was dealt with by Order in Council as it came up, but in the course of time certain principles were evolved to which general application was given under the form of regulations. These however were changed six successive times within the space of one year and after a seventh modification in January of 1847 they stood unaltered for nearly seven years. For license to occupy a location and open mines thereon priority of discovery by exploration was a first requirement; but no license could issue until the explorer reported the result of his discoveries to the Government. It was also necessary that a scientific agent of the Government should have an opportunity to mark the boundaries of limits, determine the direction of boundary lines in the case of different courses of veins on adjoining locations, and examine the statements of exploration furnished by an applicant. Reports pointing out and selecting a location were classed according to receipt and held to be the best evidence of discovery: possession by the building and occupying of a hut was proof of the next value; while priority by application was assigned a third rank of value. The extent of a mining tract was first fixed at one mile in front by five miles in depth; but afterwards in response to the petitions of explorers the limit was extended to two miles in front by five in depth, the length to be with the course of the mineral vein. The land was sold in fee simple at eighty cents (4s) per acre, $600 payable at the time of purchase or when the certificate of location was issued, to cover the cost of surveying and other contingent expenses, and the balance in five yearly payments with interest. Upon these terms the lands on lakes Huron and Superior were declared open for sale at the minimum price of four shillings per acre in blocks of ten square miles; and although it

From particulars to general principles.

Successive Regulations, 1845-53.

Priority of claims.

Area and price of mining locations.

[1] A paper read at the meeting of the International Mining Convention at Montreal, February 24, 1893. A. B.

was provided that all grants should be subject to such regulations to ensure the working of the mines as Parliament might thereafter enact, it does not appear that any conditions were required or imposed by that body.[2]

After a trial of seven years the Government became convinced that these regulations were too burdensome upon the miners. The system of allotting mining tracts had not realized the anticipations formed of it; neither had it enabled individuals desirous of engaging in mining pursuits to effect their objects without compelling them to purchase locations of so extensive an area as to call for a needlessly large outlay on acquiring a right to explore and mine where the signs were favorable. Accordingly in September, 1853, a new set of regulations was introduced by Order in Council, applicable to Upper Canada only, under which the Commissioner of Crown Lands was empowered to issue to any person upon payment of $100 (£25) a license to explore unceded lands in any county or section of the Province (named or described in the license) for copper, lead, iron, tin, marble, gypsum, earths or minerals. The license was to remain in force for two years and the holder of it might take possession of a tract not exceeding 400 acres of unoccupied land, 40 chains front by 100 in depth, and "report his discovery and selection accurately by letter and map within six months from the issue of the license, accompanied by an affidavit made by himself and some other credible person proving that no counter occupation or workings exist." At the expiration of the term of two years the license holder was required to complete a purchase of the tract selected by him at the rate of $1.50 (7s. 6d.) per acre in one sum or forfeit his right. It will be observed that these regulations did not apply to gold and silver unless they could be included under the general designation of minerals.

Regulations of 1853

In the next regulations adopted by Order in Council in March, 1861, gold and silver were specifically excluded, as doubtless it had been intended all along that they should come under the regulations of 1845-7. The new regulations also abolished the fee of $100 for permission to explore, and provided that locations be sold to the first applicant agreeing to the following conditions, viz: "That for mining purposes tracts comprising not more than 400 acres each be granted to parties applying for the same at the rate of $1 per acre to be paid in full on the sale," the applicant furnishing a plan and description of the locality to the Department of Crown Lands, "and on condition that such mineral location be worked within one year from the date of the said grant." It was further provided that a patent should not issue until two years from the date of the purchase, and then only upon proof that the purchaser or his assignee had continued to work the location *bona fide* for at least one year previously.

Regulations of 1861

In April of the following year working conditions were abandoned as to future sales, and it was agreed that patents should issue on the payment of the purchase money, but subject to a royalty of 2½ per cent. on ores raised or mined, payable on their value as prepared for market at the mine.

Regulations of 1862.

Royalty.

In March of 1864 the royalty of 2½ per cent. was changed to a tax or duty of $1 per ton on all ores except gold and silver, payable on removal from the mine, and this condition was made to apply to all mining lands sold under the regulations of 1862. It was also provided by the amended regulations of 1864 that not more than one tract of 400 acres should be sold to one person.

changed to a specific tax on all ores except gold and silver in 1864;

The new tax or duty remained in force only one year, a regulation of April, 1865, directing that the clause requiring such payment should no longer be inserted in the grant or patent. The same regulation also authorized the Commissioner of Crown Lands at his discretion to omit the clause reserving mines of gold and silver in patents for lands on the shores of lake Huron and lake Superior.

but royalty and reservation practically abandoned in 1865.

[2]The Mining Location ticket issued under the Rules and Regulations of the Orders in Council of 7th October and 2nd November, 1846, contained the condition that if the locatee should neglect to commence and *bona fide* carry on mining operations upon his location within the period of eighteen months from the date thereof he should be held to have forfeited the location and license.

The last of the regulations for the sale of mineral lands by Order in Council were brought into operation in July, 1866, and dealt chiefly with ores of the base metals. They provided for the sale of mining tracts in unsurveyed territory in blocks of 200 or 400 acres, the survey of tracts at the cost of the applicant by a Provincial Land Surveyor; the furnishing of plans, field notes and descriptions showing the connection of a tract with some known point in previous surveys, so that it might be laid down in the office maps of the territory; and payment at the price of $1 per acre at the time of making application. These regulations also provided that lands in unsurveyed territory should be sold by the Department and in surveyed townships by the local agents, and that in all letters patent for lands the clause reserving gold and silver should be omitted.

Regulations of 1866.

In 1864 there was a rush of miners and prospectors to regions of Lower Canada in which alluvial gold had been discovered, chiefly on the St. Francis and Chaudiere rivers and their head waters; and in that year, as already mentioned, the Legislature passed the first Act on the subject of Mines and Mining known as "The Gold Mining Act." It was a statute of 40 sections, drawn up with much nicety and particularity for the mining of alluvial and quartz gold and the protection of miners' rights, for appointment of inspectors of divisions with large powers, for staking out claims of small areas, for licenses to mine, for licenses to mill, for sworn returns of gold taken out, for preservation of the peace, and in short all the trappings which the wit of legislators might devise for conserving the interests of the Crown and protecting the rights and fixing the obligations of miners in a placer diggings gold land.

The Gold Mining Act of 1864.

The rush of miners and prospectors to the Chaudiere valley was of short duration. Yet the Act of 1864 not only remained with trifling amendments the law of the country down to the end of the union of Upper and Lower Canada; it continued to be the law after Confederation, when the exclusive powers to make laws for management and sale of public land belonging to each Province was assigned to the Provincial Legislatures by the new constitution, the British North America Act. A good reason for its continuance in Ontario was found in the discovery and working of veins of gold quartz in the county of Hastings, which had been set apart as a mining division under the Gold Mining Act on the 17th of November, 1866, ten days after the Commissioner of Crown Lands had received information of the discovery of gold in Madoc.[3]

Exclusive powers to make laws for management and sale of public land assigned to the Provinces by the B. N. A. Act.

Gold mining in Hastings.

[3]Under date of November 6th, 1866, Hon. Billa Flint of Belleville wrote the following letter to the Commissioner:

My Dear Sir,—There is a great stir here at present about Gold in Madoc.

Already one lot has been sold to Americans for about $30,000, and the gold is very rich; it also begins to be developed in other places in Madoc than on lot 18, 5 con.

My object in writing is to say to you that I believe it exists in Elzevir, Hungerford and other townships both east and west of Madoc, and my desire is to put you on your guard as to sales of land, as the people are going mad about lands for mining purposes.

I have for years been satisfied that there was a vein of gold running somewhere about east and west across the Back Country, and have had several specimens from Quartz Rock for the past five years.

I know Geologists will not admit that we have mineral wealth, but I do know that they cannot tell where mineral is until we find it for them; and I have no faith in their statements, for when I have given Sir Wm. Logan specimens he won't return them, nor tell me what they are.

The present excitement if kept up for a short time will bring our rocky land to high figures. Lands near this Gold discovery that could have been got for 4$ an acre 10$ is refused for them now; this shows the sanguine feeling of both holders and purchasers.

So if there is any good chance, of which I have no doubt, let the Government enjoy for the good of the whole country the benefit by sale or leases. Yours, etc., etc., Billa Flint.

Hon. A. Campbell, Commissioner of Crown Lands, Ottawa.

On this letter the Commissioner made a memorandum as follows:

I have no faith in the gold being found in paying quantities; the Chaudiere country promised much greater riches, but the only persons who have made any money there have been speculators on the delusion of others in the price of lands, and the few who have found gold in alluvial deposit. If there be any Gold in the Townships named by Mr. Flint it is in situ and the expense of working it will be found to reduce the affair to the laws of ordinary industrial pursuits. The lands however in the Townships named should be treated as Gold lands are in Chaudiere - sold at a price of $2 per acre cash, subject to Gold Mining Act.—A.C.

Gold and Silver Mining Act of 1868.

In the first session of the Legislature of Ontario after Confederation the Act of 1864 was repealed, and one known as "The Gold and Silver Mining Act of 1868" was enacted in its stead—provision for silver mining having been deemed necessary as a result of discoveries on the north shore of lake Superior in the previous year. The new features of this Act related chiefly to the granting of licenses to explore and mine for gold and silver within the limits of a mining division, and to the levying of royalties. Under the former Act a miner's license was of two kinds, viz., (1) a Crown Lands license, which upon payment of a fee of $2 per month authorized the holder to mine on any unsold public lands, and (2) a Private Lands license, which upon payment of a fee of $1 per month and after agreement with the proprietor authorized the holder to mine on any private lands within the limits of the division. Under the latter Act the fee for a license was reduced to $5 per year, and it authorized the holder to explore and mine for gold and silver upon any public lands in a division, but subject to the levy of a royalty of not less than two nor more than ten per cent. on the gross amount of gold or silver mined—the rate to be fixed by the Lieutenant-Governor in Council and variable for different mining divisions and different mines according to the yield. Proprietors of private lands were accorded the right to mine for gold and silver upon their own lands, subject to the royalty, and private licenses were abolished.

Miner's license.

The General Mining Act of 1869.

The first Act to deal with all ores and minerals by legislation.

In the following year this Act was repealed, and there was passed in place of it "The General Mining Act of 1869," a measure which for the first time dealt by legislation with ores and minerals of all classes. It however retained most of the provisions of the former Act, applying them to the occupying and working of "mining claims" under miners' licenses when situate within any mining division, but abolishing the provisions relating to alluvial mines. Larger areas were designated as "mining locations," consisting of 80, 160, or 320 acres, the price was fixed at $1 per acre, and if the locations were in unsurveyed territory it was necessary to make a survey and file plans and descriptions as required by the regulations of 1866. To a large extent indeed the old regulations became in this measure crystallized into statutory law. By this Act also all royalties, taxes and duties reserved by any patent theretofore issued in respect of any ores or minerals were declared to be repealed and abandoned; all reservations of gold and silver mines contained in any previously issued patent were rescinded and made void;[4] and it was provided that no reservation or exception of mines or minerals should thereafter be inserted in any patent from the Crown granting any lands sold as mining lands.

The old regulations crystallised into statutory law.

Royalties abandoned and reservations made void.

These general references to the Act of 1869 will suffice to exhibit the course of the development of mining legislation in our Province; but I pass by the details and take up the law now in operation.

The Mines Act 1892.

Divisions of the Act.

In "The Mines Act, 1892," the Act of 1869 and all subsequent Acts dealing with mining lands, mines and mining have been consolidated and amended. It consists of four parts, viz.: General Provisions, Mining Locations, Mining Claims and Mining Regulations, and for convenience it may best be considered under these several heads.

[4] It has been stated that most of the patents issued down to the end of 1823 reserved for the Crown mines of copper, tin, lead, iron and coal, as well as of gold and silver; but inasmuch as only the two last named were by the Act of 1869 deemed to have passed with the lands to the owners in fee simple, it may be assumed that the right to the others in all cases where the reservation was made in the patent is still in the Crown.

Bureau of Mines.

The administration of the mineral lands is presided over by the Commissioner of Crown Lands, and connected with his Department is a Bureau of Mines, established to aid in promoting the mining interests of the Province. The Director of this Bureau acts under the instruction of the Commissioner, and is clothed with all the powers, rights and authority which an inspector or local agent may exercise in a mining division or locality, and such other powers as may be assigned to him by regulation for carrying out the provisions of the Act. In practice the Bureau has charge of the mineral lands in surveyed territory (unsurveyed territory is in charge of the Department), and through it all correspondence and business relating to the selling, leasing and working of such lands is carried on. It also publishes an annual report to furnish information on the mineral resources of the Province, the progress of mining and metallurgical operations, the conditions of mines as regards the health and safety of miners, and the observance of regulations for the employment of labor.

Royalties on ores and minerals.

As in the original Act, any person may explore for mines or minerals on any unoccupied Crown lands, and such lands if supposed to contain ores or minerals may be taken as mining locations, or if in a mining division as mining claims. But lands so taken do not now carry the ores or minerals absolutely with the fee simple, as any acquired subsequently to the 4th day day of May, 1891, are subject to a royalty for the use of the Province. It is an interest which the Crown reserves in mineral lands, and may be regarded as part of the price put upon them by the Act at the time of sale or lease. Accordingly no higher rate of royalty may be levied than is provided by the statute in force when the lands are granted. The royalties are in no case to be imposed or collected until after seven years from the date of the patent or lease (but extended in the case of original discovery to fifteen years), and then they are to be calculated upon the value of the ores or minerals at the pit's mouth less the actual cost of labor and explosives employed in raising them to the surface. In this way and under these conditions silver, nickel, and nickel and copper ores are subject to a royalty of three per cent., iron ore to two per cent., and all other ores to such royalty as may be imposed by Order in Council not exceeding three per cent.[5]

[5] The question of royalties upon minerals has been warmly debated in Ontario during the past two years, and the Legislature has been charged with adopting in this matter a repressive and reactionary policy towards the mining industry. Yet it has never been shown how royalties paid to the State differ from those paid to a private owner; and throughout Europe and America the private owner of mineral land is often found leasing his property to a miner or company of miners, and levying rents and royalties like any lord paramount of a kingdom. In some countries this is the prevailing practice; but occasionally the charges are found to be so heavy and the conditions so exacting that the miners prefer to buy the property outright at any price that can be agreed upon. Thus a few years ago the Reading Railway Company paid $50,000,000 for 100,000 acres of coal lands in Pennsylvania, which has proved to be a ruinous bargain; and doubtless the lessees of Dolcoath mine in Cornwall would also have preferred, if they might, to pay an enormous sum for the fee rather than submit to the owner's fine of £25,000 at the last renewal, although he had up to that time been paid £260,000 in royalties and had not contributed a dollar to the development of the property.

In the case of the private owner there is no uniformity in the rate of royalty, which depends in part on the known or supposed value of each separate location, and in part upon the success of the owner in making a good bargain, the aim always being to get the highest rate and best terms possible. Furthermore, in addition to royalty a fixed rental is sometimes provided for, with a premium or fine at the time of renewal. In the case of an iron ore property in Scotland some years ago the fixed rent was £12,000 a year, and 7s. 6d. per ton royalty. In Michigan, Wisconsin, Minnesota, New York, New Jersey and Pennsylvania, owners of mineral lands are paid large sums every year as royalties, although often their only investment has been the payment of the original purchase price to the State.

On the Mesabi iron range in Minnesota twelve mining locations were leased last year at royalties ranging from 30 to 65 cents per ton, the average being 53 cents. Under the terms of the contracts the lessees are bound to pay royalties on a minimum output of 1,550,000 tons each year, the aggregate of which will be $820,000. Eleven of those properties were purchased from the United States Government at $1.25 per acre, and the owners will derive from them a yearly income of at least $560,000 in royalties. One property of 160 acres is land leased from the State under a royalty of 25 cents per ton, and it is sub-let subject to a minimum yearly output of 400,000 tons and a royalty of 65 cents per ton. On this output therefore the State will receive $100,000 a year, while the private lessee will receive $160,000.

Mining locations, their area and price.

Mining locations are required to be of definite form and size, whether they are situated in unsurveyed territory or in townships surveyed into sections or lots. In the territory beyond lakes Superior, Huron and Nipissing and the French and Mattawa rivers, wherein for the most part the great mineral-bearing formations of the Province lie, each location in a surveyed township must consist of a half, a quarter, an eighth or a sixteenth of a section; and if in unsurveyed territory it must be of rectangular shape with outlines of astronomical bearings, containing 320, 160, 80 or 40 acres, surveyed at the cost of the applicants and connected with some known point in previous surveys or with some other known point or boundary. The price of such locations ranges from $2 50 to $3 50 per acre, dependent on its distance from a railway and whether it is in surveyed or unsurveyed territory. For locations south of lake Nipissing the price ranges from $2 to $2.50 per acre. Any greater sum however may be charged where a district or locality rich in mines or minerals has been set apart by regulation under Order in Council, or the land in such a locality may be temporarily withdrawn from sale.

Tenure of locations by grant in fee simple, or by lease-hold for a term of years.

The applicant for locations has the choice of obtaining a grant in fee simple at the prices named above, or he may obtain a lease at $1 per acre for the first year and 25 cents per acre for each subsequent year if the lands are in the territory north of the lakes; if south of the lakes the first year's rental

Discoveries of ore on lands owned and leased by the State promise already an annual income of a quarter of a million, to be paid directly into the State Treasury in the shape of royalties, and according to H. V. Winchell of the State Geological Survey the revenue of the State from this source will within three years reach a million dollars. Upon the twelve sub-leases of locations on the Mesabi range already made the holders from the State and Federal Governments have been paid $270,000 of royalties in advance of any working, and nearly all the iron mines in this State are paying royalties to the private owners. By the Act of 1889 the State leases its iron bearing lands under a fifty years contract at a royalty of 25 cents per ton (the minimum being fixed at $1,250 a year whether ore is raised and removed or not), but its provisions do not of course apply to lands purchased from the Federal Government.

In Pennsylvania the ores and minerals in public lands have gone to the purchaser of the surface rights, including extensive land areas of hard and soft coals. Mining companies have purchased blocks of these lands from the private owners at prices ranging from $200 to $500 per acre, but usually the lands have been let by the holders to miners at royalties ranging from 25 to 50 cents per ton. How such parties have benefited by the bounty of nature is well illustrated by the case of the Girard Estate lands in Schuylkill county. When hard coal was first discovered in this county about a hundred years ago the land was quickly taken up at the low price at which public lands in the State were then held, but for more than thirty years no mining operations were undertaken upon it. About 1828 a block consisting of 18,233 acres was bought by Stephen Girard under foreclosure sale by the State "at practically nominal prices." The management of this land passed into the hands of the Philadelphia Board of Directors of City Trusts in 1832, as provided by Mr. Girard's will, but no coal was raised upon it until 1863, when lots began to be leased to mining companies at a specified royalty, increasing one cent per ton a year for fifteen years—the term of the lease. In the first year the revenue from the mining lots was $4,246. In the last year, 1892, it was $625,699, whereof $618,096 was from royalties (nearly 42 cents per ton), and the balance from rents—"a sum," the directors say in their report, "which will be largely increased for many years, and from which there will be no material decrease for twenty-five years at least." Three-fourths of the net receipts from royalties is credited to capital account and permanently invested, but "these receipts increase so rapidly that it is difficult to find legal investments for them." The sum now invested by the board, a portion of which however has come from other sources of the estate, is $3,378,925, and last year it yielded an income of $139,839. Had the State reserved the minerals the revenue on the quantity of hard coal sent to market last year, calculated on the royalty paid upon coal taken from the Girard Estate land, would have been $17,385,000; and had half the rate been paid upon soft coal in addition, the aggregate for royalties paid in the year would have been $25,000,000. In so far as the price of coal is affected, it could make no difference whether this money was paid to private individuals or the State Treasury; but as a matter of public interest the difference is obvious. The advocates of private ownership will say, as some of them have said, that reservation of minerals by the State hinders development, and that private ownership tends to promote it. This has not been the case in Pennsylvania, where most of the best coal lands were held in idleness by the private owners for more than a generation.

"Minerals in the United Kingdom," the Final Report of the Royal Commission on Mining Royalties says, "are usually worked by lessees and not by the proprietors." This Commission was appointed in August, 1889, the evidence and information which it collected, including the final report, has been published in five volumes or blue books, and its work was not concluded until March 24th, 1893. These two paragraphs, in which the leading conclusions and recommendations are summarized, are all that need be quoted here: "I. We estimate that the amount paid as royalties on coal, iron-stone, iron ore and other metals worked in the United Kingdom in the year 1889 was £4,665,043; and that the charge for

is 50 cents. per acre and 15 cents thereafter. Leases are issued for a term of ten years with a right of renewal for a further like term at the same rental if the conditions have been observed, and thereafter they may be renewed from time to time every twenty years at such rent as the regulations provide. But the lessee may at any time become the purchaser of the lands held by him, in which case the sum paid for the first year's rental is treated as part of the purchase money. This leasing system appears to be growing steadily in favor with mining men, and a large proportion of the lands now granted for mining purposes are granted under its provisions.

Locations granted subject to working conditions.

Whether a location is held in fee simple or by lease it is subject to certain working conditions, being an expenditure during the first seven years after the issue of the patent or lease in actual mining operations of $4 per acre where the area of the location exceeds 160 acres and of $5 per acre where it if of less area; and such expenditure may consist of labor performed by grown men at the rate of $2.50 per day, or for explosives or other material for mining used on the location. In default of so much work by a *leaseholder* the lease becomes void and the location reverts to the Crown: in a case of default by an *owner* all mines, minerals and mining rights so revert, but the owner retains all interests in the location as agricultural land.

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wayleaves for the same year was about £216,000. II. We are of opinion that the system of royalties has not interfered with the general development of the mineral resources of the United Kingdom, or with the export trade in coal with foreign countries."

Coming back now to Ontario, one or two instances of the working of private royalties may be cited. The lands of the Canada Company are either leased for a term of seven years or sold in fee simple. In the former case the lessee covenants not without leave in writing to open any mine, or dig or bore for oil or natural gas, or allow any work connected therewith to be carried on upon the premises. In the latter case the land is conveyed subject "to the reservation of all or any of the mines, minerals, mineral oils and natural gas on, in, or under the said lands," and to such powers, privileges and covenants to the company for searching for, working, getting and disposing of the same as the company may deem proper. In one case reported last year this company let a phosphate location in the county of Frontenac at a royalty of $2 per ton. The other instance is drawn from the discussion which took place at the meeting of the International Mining Convention upon the reading of this paper. Mr. Ian Cameron, manager of the Dominion Mineral Company's work at Sudbury (who expressed a decided opinion favorable to the Ontario mining law), said he had been in charge of the company's business only a few weeks when numerous offers were made to him of unimproved lands held by private owners in small lots at prices ranging from $40,000 to $100,000 and royalties in addition ranging from 25 to 50 cents per ton upon nickel ores. And the parties from whom those offers came, Mr. Cameron said, were the ones who made the strongest objections to The Mines Act. In the sale or other disposal of mining lands the interests of the country ought to have the chief consideration, and in his opinion these had been conserved by the Act, while at the same time the miners were treated with fairness and liberality.

Now as to the conclusion of the matter. In almost every country, but especially in Great Britain and the United States, the practice largely prevails amongst owners of mining lands to levy royalties on the minerals raised from them. There is no uniformity in the rate of the royalties, or of the rent charges for occupying the lands, or of the time for which the lease is to run. Everything depends on the opportunities for driving a good bargain; and almost invariably every ton of ore mined must pay royalty to the owner of the land whether there is profit in it for the miner or not, and a certain amount of royalty must be paid every year whether the ore is mined or not. Under the Ontario Act, if the land is sold in fee simple it is the owner's, to make the best use he can of it, but subject to the royalty provided by the Act at the time of sale; if it is leased, the lease is for a fixed term and renewable. The royalty is fixed also and cannot be increased, although it may be reduced; and if the miner does not make any profit on the ore he wins—if its value at the pit's mouth is no more than the cost of labor and explosives in raising it—the Government can exact no royalty from it. If then the system of private royalties is free from objection, if as in Great Britain a tribute of $23,000,000 a year may be imposed on the industry by the private owners of mineral lands and not interfere with the general development of the mineral resources of the country, how can it be affirmed that a very much lower and fairer rate of royalty can repress or interfere with it in Ontario where, when royalties begin to be levied at all, they will be paid into the Treasury of the Province instead of to the private owners of lands that once were the lands of the whole people? Or is a State the only landowner which cannot take the measures commonly adopted by individuals and companies to derive a revenue from royalties without being accused of adopting a repressive and reactionary policy by the parties who themselves are seeking to make incomes and fortunes out of royalties? If a share in the bounty of nature, such as unquestionably ores and minerals are, may justly be reserved to the people, the time to provide for it is while the lands are part of the public domain, not after they have been sold or otherwise alienated to private persons and corporations who have no interests to serve but their own.

Reservation of minerals on free grant lands and lands sold for agricultural purposes.

Under the system of free grants to settlers adopted in 1868 all minerals have been reserved to the Crown, and by an amendment to the Public Lands Act in 1891 they are so reserved on all lands now sold for agricultural purposes. So it has come to pass respecting those lands that two classes of rights are recognized, viz., surface rights and mineral rights. The owner of the surface rights may apply for a patent or lease of the mining rights on his lot, and his claim possesses priority except where there has been an earlier application and a deposit of at least half the purchase price or rental made, or in case of original and bona fide discovery of valuable mineral by a subsequent applicant within one month prior to the application of the owner of surface rights. In either case the price per acre of a patent or lease is one half of the rates for a mining location where surface and mining rights are not separated. But a prospector is limited in his right to go upon private land on which the minerals have been reserved to explore it. He cannot enter any portion of a lot used as a garden, orchard, vineyard, nursery, plantation or pleasure ground, or upon which are crops which may be damaged by exploring, or on which is any house, church or cemetery, except with the written consent of the owner or locatee. Neither can the person to whom mining rights have been conveyed go on the land to open it for ores or minerals until he has first agreed with the owner of surface rights for compensation and damage: but should the parties fail to agree it is in the power of the Director of the Bureau of Mines to order and prescribe the manner in which compensation shall be ascertained and paid or secured, either by an arbitrator appointed by himself or by a suit or action in any county or district court between the parties.

Surface rights and mining rights.

Pine trees reserved to the Crown, but owner or lessee of a location may cut and use for certain purposes.

It is to be observed that in all sales or leases of mining locations all pine trees thereon are reserved to the Crown, and should the locations lie within a timber limit the holder of a license to cut timber on the lands may enter upon them and cut and remove the trees. Yet although the patent or lease expressly reserves pine timber, the owner or lessee may cut and use all pine and other trees needed for building, fencing and fuel on the land, and for any purpose essential to working the mines upon it, as well as cut and dispose of all trees required to be removed in clearing the land for cultivation. But a lessee is restrained from using pine trees for fuel other than dry pine, and should he intend to clear any portion of the land for cultivation he is required to give the holder of the timber license three months' notice so that he may remove any pine on the area to be cleared. If at the end of that period it is not removed the lessee may cut and dispose of all trees on the land to be cleared, but subject to payment of the same dues as are payable by the holder of the license. The privileges of the lessee are also circumscribed in another particular. Should he during the first ten years seek to cut timber other than pine upon his location beyond what is needed for building, fencing or fuel, or in the course of actual clearing for cultivation, or for any purpose essential to the working of the mines, he must first apply for leave to the Commissioner of Crown Lands, who may grant authority to cut the timber and fix the rate of dues to be paid upon it. But inasmuch as a lessee may forfeit and abandon his title to a location by the simple process of neglecting or refusing to prepay the yearly rent, it is not reasonable that he should be treated with the same liberality as an owner in respect to the timber upon the land. The important point is however that both owner and lessee of a mining location are entitled to the free use of all the timber upon it which may be wanted for mining purposes, while the owner is entitled to the free use of all timber excepting pine upon it for any purpose. The owner or lessee of mining or underground rights has of course no claim to use of the timber upon a location which, as far as it goes at all, goes with the surface rights.

Exemption in case of lessee.

The important point.

Mining claims.

The portion of the Act which relates to mining claims and the manner of acquiring, holding and working them is for the present inoperative, inasmuch as no tract of country has been declared or set apart as a mining division.

The reason no doubt is that circumstances have not arisen to call for utilizing the system for which it provides, either by reason of the distance of mining fields from surveyed or settled territory or the discovery of fields very rich in gold or other valuable ores where small areas would satisfy the desires of mining men. Mining locations are preferred, and there is not a demand for mining claims. Yet it is possible that the demand may arise in some portion of the vast mineral-bearing formations of the Province, and in view of that contingency it is well to have a provision ready at hand to which effect may be given at the will of the Executive.

Areas of mining claims.

In the Mining Act of 1864 the area of a claim which might be staked out by one person holding a license was less than half an acre and by a company of persons not more than about 2½ acres, and these areas were doubled by the Act of 1869. The Mines Act 1892 provides for staking out by one person a claim 660 feet along a vein by 330 feet on each side of it (about 10 acres), and by a company of persons a claim not exceeding at the maximum 1,320 feet along the vein by 330 feet on each side of it (about 20 acres). But no person has the right to stake out a claim or to mine it who does not first obtain a miner's license, for which the fee is $5, and pay a year's rent for a claim at the rate of $1 per acre. A license is renewable only upon payment of the fee and of the annual rent for a claim, and the tenure of a claim depends besides on stringent working conditions. Adequate provision is made for the protection of miners' rights in a division, and for the enforcement of law and order under the authority of an Inspector.

Miner's license.

Inspection of mines.

The fourth part of the Act is chiefly designed to provide for the health, safety and well-being of miners through a proper and careful observance of regulations for the working and management of mines; but as these follow pretty closely the British Mining Regulations any enumeration of their features would be superfluous here. The Inspector, whose duty it is to look after their enforcement, finds that owners and officers of mines are with rare exceptions desirous of doing liberally all that the regulations require, and it does not appear that the employed classes have a grievance under them for which legislation could effect a cure.

REPORT OF THE INSPECTOR OF MINES.

To the Director of the Bureau of Mines:

Sir,—I have the honor to submit herewith my third annual report on the Inspection of Mines for the Province of Ontario, being for the year 1892.

General condition of the mining industry.

Although mining operations have not been conducted throughout the Province on as broad a scale as could be desired, yet in some of the classes of minerals encouraging results may be traced, especially in gold, nickel, copper and mica.

Several of the hitherto large-producing silver mines west of Port Arthur have been closed down, not by reason of having become non-productive, but from causes which may but temporarily suspend the work. The phosphate markets have been dull, and on this account several of these valuable properties have been lying idle during the year, while others have been worked only to a limited extent.

GOLD.

In Lake-of-the-Woods region.

The Sultana and Sultana Junior mines.

The Sultana mine is situated eight miles from Rat Portage, on the Indian reserve, location X42, and is owned by Messrs. John F. Caldwell of Winnipeg, holding fifteen-sixteenths, and H. Henessy of Rat Portage, one-sixteenth. Mr. Caldwell holds the mineral claim X43 Indian reserve and B38, comprising 40 acres. Mr. W. M. Caldwell has the management of the property. A few men were at work from the beginning of the year, and in March the force was increased to 8, who had been constantly employed up to June, the date of my visit.

The place of working is near the landing or dock, and the ore is removed from the opening in wheelbarrows to the place of shipment. An open cutting has been made to the distance of 250 feet in a northeast direction, following the side of the lake, and has been worked to the depth of 15 to 18 feet, showing a width of vein of 27 feet. The lead has been traced between granite and slate a distance of about 20 chains. The lowest cutting is only 5 feet above the high-water mark of the lake. About 130 tons of ore had been mined and removed to the dock ready for shipment to the Reduction Works at Rat Portage. Other openings had been made in the property the fall previous. One which I especially noted is about 500 yards in a southerly direction from the present workings, on a steep elevation, and from which 350 tons of ore had been mined and taken to the mill at Rat Portage. A comfortable boarding-house, a blacksmith shop and convenient docks have been built. It was intended to put on additional force and use steam power for drilling and other purposes so soon as the ore could be properly treated at the mill in the town.

A force of 32 men was employed at the mine and mill at the close of the year. Mr. Margach of Rat Portage in a recent letter states that a stamp mill with rock crusher for pulverizing and Frue vanners for concentrating the ore, is in successful operation at the mine. I note also by a late communication through the papers that a fine gold brick has been turned out of the works as proof of the value of the ore and the successful method of treating it. On Sultana Junior six men were then at work.

The Northern Gold Company's mine.

The Northern Gold Company, formerly known as the Gold Hill Company, are engaged working their prospect, which is situated on the mainland twenty miles southeast of Rat Portage, and contains 906 acres held in fee simple. This discovery was made eight years ago by Mr. George Dulmage, the present superintendent of the work. D. B. Burdette of Belleville is president, and J. R. Wright is the business manager. Ten men had been employed for the past year and their number was increased to thirteen when I visited the property. The workings consist of a shaft sunk to the depth of 28 feet, with other openings following the lead for at least a mile. Shaft No. 2, the present place of working, has reached a depth of 45 feet at an angle of 45 degrees, following the mineral between well-defined walls. The vein matter is 9 feet in width, with about 3 feet of pay streak.

The Leede process adopted.

A carload of the ore taken from these workings had been sent to Minneapolis to be tested by the Leede process, and so satisfactory was the trial that an order was given for a plant to be put up at the mine, although formerly stamps and other machinery of the ordinary class for a mill had been ordered; these were abandoned. The whole of the plant for the new process was expected to arrive and be placed in position for work in a month or two. The boiler is of 40 horse power. The ore will be roasted by gas generated from petroleum, using 12 barrels daily. About 150 to 175 tons of ore were ready for treatment, and by the Leede process this ore will be reduced to bullion. A tramway is now being constructed from the mine to Moon bay, a distance of 1½ miles, which will be in use shortly. Through a reliable correspondent I am informed that 24 men were working on this property at the end of the year.

Homestake mine, on Yellow Girl bay.

The Homestake mine is on a strip of the mainland at Yellow Girl bay, about 25 miles in a southerly direction from Rat Portage, and is owned by the Homestake Company of Algoma, with capital stock of $300,000, in shares of $1 each. About 65,000 shares have been disposed of, and the proceeds are to be used for development purposes and constructing a mill at the mine.

Mr. Heldrith, a member of the company, is manager of the works, and at the time of my visit had mined about 50 tons of ore, 25 of which had been taken to the Reduction Works at Rat Portage. He had a contract to deliver 1,000 tons at Rat Portage, which he expected to accomplish at the rate of 30 tons daily. The proceeds are to be used for the further exploring and developing of the property.

A letter in January, 1893, from William Margach, Crown timber agent, states that "ten men are at work on the mine, and Messrs. Heldrith & Chadwick have a stamp mill which they propose putting in operation."

The Dead Broke mine.

The Dead Broke mine is located on P64, Red Rock island, about 22 miles in a southerly direction from Rat Portage, and is owned by Jeff. Heldrith.

Work on this mine was commenced in April last with ten men, and the vein has been stripped 50 feet in length and nearly the same in width. An open cut has been made 20 feet in length and 12 feet in width and a few feet in depth, from which about 75 tons of ore have been removed, and showing by frequent assays from $7 to $133 per ton; 25 tons of the ore have been taken to the Reduction Works to obtain a mill run. The work was interfered with by the inflow of water, and a new opening has been made at the distance of 130 feet from the former one and the tunnel has been driven in 25 feet. It is intended, I was informed, to put on an increased force and work the property on an extensive scale.

Gold Creek mine, near Pine Portage bay.

The Gold Creek mine is situated near Pine Portage bay, one mile from the point at the head of the bay. The location comprises 180 acres P347, and is owned by Messrs. E. H. Kendell, Samuel Whiting and Joseph Thompson, all of Rat Portage. The discovery was made in 1890; work was commenced

with a force of seven men in the fall of 1891, and has been continually carried on under the direction of G. F. Ernst, who has had large experience as a miner and who now holds the property under lease. A vertical shaft has been sunk to the depth of 50 feet, following a vein with average width of 9 feet from the surface to the bottom of the shaft. The shaft is well timbered to a depth of 15 feet through the clay and sand, where a firm slate formation has been reached with well defined walls requiring no supports. Two test pits have been sunk, one 8 feet on a vein of 10 feet in width, and the other 16 feet deep on vein matter of 14 feet width. The vein has been followed on the surface by openings at intervals for the distance of 500 feet west, and in a southerly direction for 2,000 feet. A force of seven men was employed at the date of my visit in June. Extent of the workings.

About 300 tons of ore had been taken out and was being conveyed by tug to the Reduction Works at Rat Portage for treatment. The place of shipment is at Heenan's point, a distance of one-third of a mile from the mine, where a convenient dock has been built. The ore which was being shipped had been taken to the dock in the winter season. A good roadway was being constructed from the mine to this dock.

A good boarding-house and shaft-house have been built, and the whole of the work in and about this mine has been done in an exceedingly neat and substantial manner.

Eight miles from Rat Portage, and near Sultana island, the Ontario Mining Company own a location on which a shaft has been sunk to the depth of 50 feet, from which excellent samples of ore have been taken. The property is owned chiefly by Winnipeg capitalists. Ontario Mining Co.

The Winnipeg Consolidated Gold and Smelting Company own a property on Big Stone bay, 18 miles out from Rat Portage. Several years ago this property was worked for one year. A shaft was put down 120 feet and drifts run in with such excellent results that a stamp mill was put up. The ore was of good grade. Winnipeg Consolidated.

The Pine Portage mine is situated one mile inland from Pine Portage bay, and about eleven miles from Rat Portage. A shaft has been sunk 120 feet and about 50 feet of drifting done. The property is regarded as valuable and a watchman resides upon it. Mr. Dobie, one of its chief owners, stated that it was probable work would be resumed during the present year. Pine Portage mine.

The Climax mine, owned by A. Egan of Winnipeg, is situated on Big Stone bay, about 10 miles from Rat Portage. From an open cut in the side of the hill 600 or 700 tons of ore have been raised, most of which has been taken to the Reduction Works at Rat Portage for treatment; 36 assays showed the average value of ore to be $7.9 per ton. Climax mine.

The Keewatin mine is situated on Hay island, 10 miles from Rat Portage, one of the largest islands of Lake-of-the-Woods, which may be regarded as a lake of islands. It is owned by Good & Jones of Winnipeg. Keewatin mine.

On the Heenan mine, which is one mile south of the Keewatin, a 50 foot shaft has been sunk; it is the property of the owners of the Keewatin mine. Heenan mine.

On Boulder island, containing 12 or 14 acres, a discovery was made a few years ago, a considerable amount of development work done, and a mill put up, which was afterwards moved to the Consolidated mine. The property is owned by William Gibbons and others of Winnipeg. Boulder Island mine.

On Fish island, near to Boulder, a promising discovery was made seven years ago, and the property was obtained by a company of capitalists from California and worked to a limited extent. One shaft was put down 30 feet, when the work was suspended for the same cause as on the Boulder and other properties—a disputed title. Fish Island mine.

El Diver, Caribou and Treasure mines, near Rossland station

The El Diver mine is on location P351, which comprises 80 acres and is situated 2¼ miles north from Rossland station, Canadian Pacific Railway, 8 miles east from Rat Portage. The property is owned by Messrs. J. W. Webster and E. W. Gaylord of Cleveland, Ohio. Mr. Gaylord has charge of the works at the mine.

Work was commenced in October, 1891, with a force of five men, which was increased to seven during the winter. Ten men were employed in June at the time of my inspection. The principal shaft has been sunk to a depth of 60 feet, following the vein matter from the surface with an average of two feet of pay ore. The work was being done by contract, and about 200 tons of ore were on the dump.

A mill for concentrating the ore has been erected, and the machinery would be in place and all running in about a month. The concentrates were to be treated at the Reduction Works in Rat Portage. It was intended to continue operations both at the mine and mill with a sufficient force to fully test the value of the mine, and to increase the work as the development would warrant. The owners hold the property with a view of working it, rather than as a speculation. A dwelling house with office was being constructed, and a good boarding-house and blacksmith shop have been completed. Other prospecting was being done on the property. I directed the attention of the manager to some necessary work to be done for the protection of the workmen in walling off the ladder-way in the shaft and timbering near the surface.

Mr. Webster also owns P288, comprising 80 acres, known as the Caribou, about half a mile from the station, upon which some development work has been done with excellent showing of mineral.

The last of October I received a communication from Mr. Gaylard stating that the necessary work for the safety of the mine had been properly done, also that the shaft had been continued to the depth of 75 feet, and a shaft house was being built. A friction power hoist has been purchased from the Jenkes Machine Company, Sherbrooke, Que., which will be run by rope belt from the mill. The mill building has been increased to double its size and the mill dam raised, greatly increasing the supply of water for power. The dwelling house with office have been finished, an ice-house built, and also an additional barn and stabling accommodation.

The pulverizer which was on hand when I was there has not proved a success, and a Crawford mill has been put in in its place. It was intended, Mr. Gaylord writes, to push the work forward throughout the winter both in mine and mill if water supply and weather should permit. He also writes: "We have purchased a property two miles south of Rossland (80 acres) known as The Treasure. The ore there carries free gold in abundance at the surface; we are down about 28 feet. The showing at the bottom is not as good as at the top. The vein measures from 2 feet to 6 inches wide. We have erected several log buildings, such as boarding house, blacksmith shop, ice house, barn, magazine, etc. We intend to push the work on the shaft this winter, but shall not erect a mill before spring."

The Gold and Silver Reduction Works at Rat Portage.

About the middle of June I visited the Gold and Silver Reduction Works in the town of Rat Portage. The capital stock of the company is $200,000, with about one-half this amount paid in and used for the construction and outfit of the mill. Charles Brent has the superintendence of the work and J. P. Larkins of Rat Portage is the secretary of the company. Through the courtesy of these gentlemen I had an opportunity of carefully examining the works, and obtained through the superintendent a full explanation of the process being adopted in the extraction of the precious metal from the ore. The mill had just started up and about nine tons of ore were running through daily with the exception of being treated in the chlorination department, which was not yet fully completed. A large quantity of ore was being

delivered on the dock at the mill for treatment, and it was expected a full supply would be obtained from the mines operated in the vicinity to keep the works constantly running. I forego giving an account of the mill taken at the time of my visit, as by the favor of Mr. Brent the following note has been recently received describing the process, results, changes and prospects of the Reduction Works and other mills, and the condition of several of the mines, which may be permitted insertion here as a matter of much information and interest. Mr. Brent writes:

Change of proprietorship.

"As to the Reduction Works, I regret to say that we shut down in August of last year owing to the fact that the pulverizing machinery proved useless. Our plan in brief was as follows: The ore (gold) is crushed wet to 40 mesh, the free gold extracted on plates and by pans and settlers; the tailings from these were concentrated. The concentrates were roasted in a reverberatory furnace and treated by chlorination.

"I am glad to be able to inform you that a wealthy American syndicate has purchased the Reduction Works and will put in new and suitable machinery to properly reduce the ores of this district.

General prospects of the Lake-of-the-Woods mining territory.

"As to the mines: things look very favorable at present, and if appearances are to be trusted a boom in mining will take place in the spring.

"During the fall I put in a 10-stamp mill at the Sultana, which is in successful operation and is a dividend payer. I am sorry to say however that very little has been done in the shape of mining development. The machinery consists of a hoist to bring the ore to the mill; a 7 by 10 Blake crusher; 10 stamps of 850 pounds each in two batteries of five stamps each, with inside copper plates and 12-foot electro-silvered copper tables. The tailings are treated by concentration over two improved Frue vanners.

"I am at present in charge of the mill at the Bulldog. We are putting in two 10-ton Crawford mills. The company is pursuing a policy of vigorous underground work and at present (50 ft) the mine looks well.

"Our next neighbors at Gold Hill have completed a new mill to be operated by the Leede process. This is a process of roasting by gas manufactured from crude petroleum, followed by amalgamation in pans, gold plates and Cook amalgamators.

"At the Treasure, south of the C. P. R. at Rossland, they are sinking with good prospects, and will put in a mill in the spring.

"At the El Diver a Crawford mill has been put in place, but they are tied up for water. They are sinking with fair prospect of success.

"The Rajah Mining Co., an English syndicate, is operating on a piece of property five miles from Rat Portage, in a northeast direction.

"The Bullion Mining Co. is sinking a shaft about five miles north of town.

"The Homestake Co. is sinking a shaft on Middle island with good showing.

"A large amount of prospecting will be done as soon as spring opens."

In the Lake Superior region.

The Ogema mine is situated in the new township of Dorion, about 8 miles from Onimet siding, C. P. R., 40 miles east of Port Arthur and 7 miles east of Pearl River station, which is the post and express office for the company.

The Ogema mine in Dorion township.

The Ogema Mining and Smelting Company was organized under the laws of New Jersey and Ontario, with a paid up capital of $150,000. The property comprises 400 acres. Mr. John C. Smith, one of the shareholders, is manager for the company and has charge of the works at the mine. Work has been continued since September, 1891, when it was begun with a force of five men, but increased to ten at the date of my visit, June 25th. A good team is used by the company in assisting to build the Government road leading out in the direction of the mine, and hauling in machinery and supplies for the mine.

Character of the vein.

In addition to considerable surface workings a shaft of 8 by 10 feet has reached a depth of 50 feet, following the lead of galena and gold ores from the surface to the bottom. The vein is the full width of the shaft at the place of working. The sinking is still in the overflow, the formation being eruptive. The gangue consists of granite, soft trap, amethysts and quartzite, intermingled with fluor and heavy spar, and carrying numerous pockets or deposits of gold carbonates assaying as high as $668 in gold and $8 in silver. Large quantities of galena are found in the workings, some assaying 65 per cent. with $7 50 of silver. The carbonates are put in barrels and a considerable quantity of ore in the rock was lying on the dump.

The mine is provided with a good outfit for convenient and rapid working, consisting of one 15 h. p. boiler and one 12 h. p. engine, a Copeland & Bacon hoist machine, machine drills, steam pumps, etc. A pony saw-mill has also been erected to cut the lumber and fuel required at the mine.

Suitable buildings have been constructed; shaft-house, engine-house, blacksmith's shop, cooking and sleeping camps; also a superintendent's residence with office attached, a warehouse and stabling sheds for horses and implements, and a magazine. The mine was in a good and safe condition.

In a communication received from the manager of the mine since the close of the year he informs me that the mine is still being vigorously developed, although work has been suspended for a short time on account of the extreme cold. Two shifts of men were to be put on almost immediately. In reference to the Crawford mill he writes, "Owing to the immense amount of oxide in our ores the Crawford mill did not give good results. It is a well-known fact that amalgamation is prevented by oxides, particularly that of iron. The Crawford mill however is the most perfect pulverizer and amalgamator I know of, and I believe is doing a grand work on the free milling ores at Rat Portage." He also states, "We have increasingly strong indications of a rich deposit of gold and silver."

Failure of the Crawford mill to treat the ore.

In East Algoma and Nipissing region. Ophir mine.

A large amount of prospect work has been done on the property known as the Ophir mine, north of Thessalon, and very excellent results obtained. Specimens of nuggets have been widely distributed among mining men. Rare specimens I learn have been forwarded for the Columbian Exposition at Chicago. The property has been acquired by a syndicate of Duluth capitalists.

The Creighton gold mine.

The Creighton gold mine is situated three-quarters of a mile from the Vermilion river, in the township of Creighton. It is being worked by an Ottawa syndicate, of which Mr. Seybold is president, and the work on the property is under the direction of J. R. Gordon, C E. Two lots, 11 in the fourth and 11 in the fifth concession, have been located and development work has been done on both. When at the mine the last of June a shaft had been sunk 50 feet at an incline of 40 degrees, following the vein from the surface. The outcropping quartz-bearing gold could easily be traced for 500 or 600 yards south, and at a width of 250 to 300 feet. The vein matter at the place of working is about 15 feet wide and contains gold of the value of $12 to $20 per ton. A 20 h. p. boiler and a 15 h. p engine are used for running the steam drill, and a Pulsometre pump discharging when operated a 2½-inch volume of water. Six or eight men were employed when I was there.

A good road has been built from the mine to the river, down which the chief supplies for the mine are brought, and a comfortable log building has been put up for boarding and lodging the men.

Balfour mine.

I visited the property of George Bennett of Chelmsford on May 30th, which is 4½ miles from Chelmsford station on the main line C. P. R., west of Sudbury 12 miles.

This property is on lot 6 of the first concession of the township of Balfour, and was being worked for gold and silver by a few men. A shaft had

been put down 13 feet and drilling 35 feet from the bottom of the shaft. About 200 feet from this place another boring has been made to the depth of 35 feet. The surface formation is slate, with quartz underlying.

Assays have been made of ore taken from the surface and from the bottom of the shaft, and also from the deeper borings, showing from $2 to $8 of gold and from $1 to $5 of silver per ton. A good level road has been built from the station to the mine.

A gold property was located in the fall of 1891 about 20 miles east of Sudbury, 13 miles northeast of Wahnapitae station on the Canadian Pacific Railway, and 6 miles east of Wahnapitae lake near lake Kookogaming or Rabbit lake. The discovery was made in a swale, where in drift boulders free gold was found in the form of small nuggets. The property was obtained by Colonel Shaw, A. McArthur and others of Toronto, who engaged Peter McKellar of Fort William to examine and report upon the property. Mr. McKellar traced the boulders to their place of origin, a distance of only 200 feet, where several segregated veins were found. An assay test made from one of these veins by Mr. McKellar showed as high as $2,400 per ton of coarse free gold. Frequent assays showed quantity, from traces to the amount named. Other large well defined veins are found upon the same property which show free gold at the point of exposure, but are chiefly uncovered. Rabbit lake location.

It is intended to prosecute further work at an early date to test the value of the property and, if satisfactory, operations will be commenced on a large scale and suitable machinery introduced for efficiently working the mine.

From the present indications Mr. McKellar, who gave me the foregoing description, regards the property as one of encouraging promise.

A mine containing some gold and silver was discovered in 1891 by A. D. Cummings of Nipissing on the south shore of lake Nipissing, about two miles west of the mouth of South river. A limited amount of prospective work was done in the early part of the year by John McAree, P.L.S., at the instance of A. A. Wright, 273 Chestnut street, New York. The work done was in making excavations at several points on the vein and in sinking a shaft 6 by 8 feet to a depth of 35 feet. The vein is about 20 feet wide, and the gangue consists of quartz, country rock and gneiss Nipissing mine.

To fully test the value of the property Mr. McAree writes that the shaft will have to be sunk much deeper; "that there is a good strong fissure vein admits of no doubt."

In May six men were engaged in working in the Carscallen shaft of the Belmont mine, in the township of that name, which had reached the depth of 100 feet, being 25 feet additional since my last report. The gangue matter contained about 15 per cent. of suphurets. At 70 feet a level has been run in a short distance, and a cross-cut shows the vein to be 15 feet in width. In the O'Neil shaft additional sinking of 10 feet has been done, making this shaft 34 feet and showing a similar grade of ore as that taken out previously. A few additional feet in depth has also been made in the Strickland shaft. The four Crawford mills set up in the village of Marmora had been run at the date mentioned to the extent of treating 220 tons of ore taken from the mine, which ore was found to be highly refractory, carrying iron and copper pyrites. The results as given to me showed a saving of 98 per cent., the assays indicating but traces of gold in the tailings not to exceed 2 per cent. In the Hastings mining region. Belmont mine.

In the process of treatment the ore is passed through a Gates crusher and then introduced to the top of the mill by an automatic feeder in a continuous stream. It is there pulverized by nine balls of about 75 pounds each, which are constantly kept in rapid motion by a revolving disc which produces both a circular and lateral revolution, and by which the ore is ground Process of treatment.

to an impalpable mass, completely disintegrating the gold from the rock, which then settles into the trough or sink at the bottom of the mill and forms an amalgam with the quicksilver, which has been supplied to each mill to the extent of 125 lb. There is a constant stream of water injected into the mass at the bottom of the mill, which flowing over the disc serves the double purpose of keeping the quicksilver pure and causing an overflow about two feet above, carrying with it the pulverized silica or quartz and other impurities and leaving below the precious metal. The ore is reduced to a fineness to allow of 60 per cent. to pass through a 200 mesh, 80 per cent. to pass through a 120 mesh, and all to pass through an 80 mesh screen. The loss of quicksilver in the test run was 2 lb., the entire quantity used being 500 lb. for the four mills. By the ordinary process of retort the gold was run into a brick and the standard reached 92½ per cent. of gold and a small percentage of silver.

In August, at the time of my second visit, the mine was not being operated. In a letter recently received from A. W. Carscallen, M.P., he says: "The Belmont mine is in full blast with a large Crawford mill running night and day, and a second one to be added shortly. They have about 30 men employed and everything is moving lively. The vein as it increases in depth is increasing in richness, and the outlook for this property is very bright indeed. I think the shaft is down about 120 feet, and they have started levels at 30 and 70 feet. The property is being worked by Middleton Crawford, the inventor of the mill, who is getting things in shape so that it will be a most convenient and economically-worked mine. The Crawford mills have fully come up to my expectations, and are now fairly well introduced into Ontario, both here and in the Rat Portage district, where there are three large mills at work now. A number more have been ordered for spring delivery, and the prospects are very bright for both mines and Crawford mills the coming summer. There are no other properties being worked in this section just now, but some capitalists have come in and purchased lithographic stone, and are getting ready for operations as soon as the weather gets warmer. The chances are that there will be a great boom all along the line in mining next summer in this and other sections."

The Crawford mill a success in treating Belmont ore.

Other gold property in Belmont.

T. D. Ledyard of Toronto, dealer in mines and mineral lands, writes that "gold has been found in several places on the east half of lot 19 in the first concession of Belmont. This lot is adjoining the one on which the new Belmont gold mine is situated.

Gatling mine.

The Carter-Walker process.

I have been informed that the Hastings Mining & Reduction Company have six men at work on surface ore of the Gatling mine; also that a mill is under construction at Marmora village for the treatment of ore by the Carter-Walker process, which consists in crushing and roasting the ore and forcing vaporized mercury through the pulp, which is afterwards treated in settlers.

The Crescent mine.

The Crescent mine was lying idle throughout the winter, but re-opened early in June. At the date of my inspection, August 10th, forty men were employed at the mine and mill. George McDougal had the management, with Wm. McDougal as assayer. J. N. Baker of Nova Scotia had the charge of the mill.

Work was continued on the Mackenzie shaft, which had reached a total depth of 65 feet in barren rock, crossing a vein of ore however at the depth of 50 feet.

The shaft now known as the A shaft was being worked with a few men, in contact with good ore. A considerable quantity of ore was being taken from the large open pit, where the principal work was being done.

The mine is being worked with care, and apparently it is in a safe condition for the workmen. An open pit near the mill required fencing, which the

manager said would be immediately attended to. The mill had been running for only 8 or 10 days previous, and was treating about 20 tons of ore in 24 hours. For description of mine see former report.

A few tons of ore had just been treated in one of the Crawford mills, but the cleaning up had not been finished, and the results were not known when I was at the mine.

SILVER.

Murillo and St. Joseph mines.

The Murillo mine as well as the St. Joseph mine on the adjoining lot have been lying idle during the year. For description of properties, see former reports.

Beaver mine.

The Beaver mine suspended operations both in the mine and at the mill shortly after my last visit in July, 1891. A watchman has the care of the property.

Badger mine.

At my visit to the Badger mine in June a few men were employed unwatering one of the shafts and doing a small amount of work by way of refitting some of the dilapidated places. The suspension of work on this mine, so largely productive in former years, as well as the Beaver, I was informed was not for want of rich bodies of ore, but must be attributed to other causes, the chief one being the depreciation of silver. See former report.

Climax mine.

In June I examined the Climax mine, which is on mining location T 145, half a mile north of the Porcupine and about 1½ miles from Silver Creek station on the Port Arthur, Duluth & Western Railway, to which a good wagon road has been built. The property is owned by capitalists of Minneapolis and Canada, no company having yet been formed. J. H. Sinclair of Minneapolis, who resides at the property, has the entire superintendence of the works. There are two parallel veins on the property, running 30 degrees north of east and 300 feet apart. The mine has been worked constantly since the 1st of December, 1891, with a force varying from 6 to 13 men. Previous to the present owners purchasing the property some development work had been done in sinking two shafts to the depth of 34 feet each, one on each vein, and also running in a drift on the No. 1 or south vein about 80 feet. Another drift was run in on No. 2 or north vein 35 feet.

Extent of the workings.

Under the present management the level on No 1 vein has been continued an additional 128 feet, making its total distance 208 feet and following the mineral from the place of its intersection at 50 feet from the mouth of the drift, thus opening the vein 158 feet. At a vertical depth of 31 feet from the former drift another level has been driven in 135 feet, exposing the vein for a distance of 70 feet. In the first level, at a point 50 feet from its entrance, a winze has been sunk 31 feet to intersect the level below.

On vein No. 2 the old level was continued a further distance of 40 feet, making a total of 75 feet from the entrance and following the vein the entire length. At a vertical depth of 30 feet from this level another one was driven in 213 feet, following the lead for 123 feet. There is a valuable showing of ore in this mine.

These workings are in slate formation, and the gangue consists of calc and fluor spar, quartzite, sulphide of iron and zinc blende, holding leaf and black silver, with a small portion of galena. A force of 10 men was employed.

West Silver Mountain mine.

Captain Rapsey informs me that West Silver Mountain mine has been closed since May 1st on account of the death of Mr. Drake, the owner of the property. It was expected work would be resumed so soon as the necessary arrangement could be made with the estate of the deceased. At the time work was suspended shaft No. 2 had reached a depth of 142 feet.

On the second level drifts had been extended to the distance of 364 feet west and 198 feet east. Drifting in the first level, which is 37 feet from the

surface, had been continued to the extreme distance of 151 feet west, and at a point 125 feet from the shaft a winze had been sunk to the level below.

Since my last report but little work has been done in the lowest level. A considerable quantity of valuable ore had been taken out of the mine and shipped. Mr. Rapsey states in a recent letter that "the mine never looked so well as when shut down."

Gopher mine.

Discovery of the Gopher mine was made about two years ago by I. S. Roberts on the south half of lot 11 in the fourth concession of the township of Strange. The property is owned by a number of capitalists of Minneapolis, and the company formed is known as the Gopher Gold and Silver Mining Company. Capital stock, $100,000, all paid up. Mr. Howard of Minneapolis is the managing director; office, 707 Globe building. Mr. Roberts has the superintendence of the work at the mine.

Work was begun a year ago last April and continued until Christmas with from 6 to 9 men. One shaft was sunk 104 feet on a vein of 10 feet in width, and at 50 feet from the surface a drift was run in 52 feet on the vein and a cross-cut of a few feet was made. Assays from these workings show value of the ore running from $5 to $60 per ton. At a distance of 250 feet from the first, a second shaft was put down 20 feet on vein matter. No. 3 test shaft was sunk between the first and second 21 feet, in which was found a good showing of native silver.

The machinery consists of one 20 h. p. boiler, a 10 h. p. engine and a pump; but so far the pump had not been required for use.

An engine house and good dwelling house, blacksmith's shop and drying room for the men have been put up. It was expected work would be commenced again about the first of August.

Augusta mine.

Work on the Augusta mine was suspended in November, 1891. Since the former report about 60 feet of drifting has been done and a shaft 12 feet deep sunk at a distance of 130 feet from the mouth of the last drift opened. In this shaft it is said good ore was found. Mr. Griffis, the manager, informed me that the property would be worked again about the first of September.

Mines lying idle.

Silver Bluff mine was lying idle. Mr. McEwen, the manager of the Shuniah Weachu or East Silver Mountain mine, informed me that work had been discontinued at this mine October, 1891. No additional work except exploring had been done since last report. Silver Bluff, Crown Point, Silver Centre and Palisades mines were also lying idle.

Guaranty mine.

Mr. McEwen has charge of a new property known as Guaranty mine, comprising 160 acres, situated on the fourth concession of Strange, six miles east of Silver Mountain. It is owned by a company in Minneapolis; capital stock $150,000. I found 12 men employed under Captain James. A vertical shaft has been put down 45 feet on a quartz vein. Boiler and engine 16 h.p., with suitable hoist. An engine house and comfortable boarding camp have been built.

Empire mine.

The Empire mine location comprises 135 acres, being lot one in the second concession of O'Connor, and adjoining the Beaver location. Work was done as early as 1889 by sinking a test shaft 14 feet on the north part of the property. An opening was also made in the hill side on the south part of the location, opening a promising vein of ore, and a shaft was sunk 14 feet. North of this opening, 112 feet, a shaft has been sunk 16 feet deep, exposing good ore, and west of this opening another shaft has been put down 26 feet. Work has been retarded on the property on account of inflow of water. This mine gives an exhibit of very rich ore.

The property known as RXX mine is situated in the township of Scoble, comprising 80 acres. It is about 25 miles west of Port Arthur, adjoin

ing Rabbit Mountain, and is owned by Joseph Brimson and R. E. Mitchell, both of Port Arthur. This mine, which is due south 1¼ miles from the famous Beaver, has been worked since November, 1891, and had a force of seven men employed when I was there. T. R. Walker of Port Arthur has the management of the work. RXX mine.

A vertical shaft 7 by 10 feet was sunk to the depth of 98 feet, following the vein, which is from three to four feet in width, evidently being a tracer of the Beaver vein, and showing silver which becomes richer at the bottom of the shaft. The shaft was still in the trap rock, but the slate formation was expected to be reached at an additional depth of from 15 to 20 feet. Hoisting was done by a whim. A boarding house, sleeping camp, dry house, stabling and a blacksmith's shop have been erected.

Upon examination of the Lily of the Valley property, which I visited on June 14th, I found that two distinct veins of ore had been opened and traced for a distance of about 50 rods. Their course is east and west Lily of the Valley mine.

Starting at the farthest point east, the two veins are about 300 feet apart. The north vein runs due west and the south vein north of west, so as to form a junction with the other vein at a point 50 rods west. The first discoveries were made on the two veins nearly opposite each other, and about midway between the two extremities. A shaft was sunk on the south vein a little west of the place of discovery to the depth of 20 feet, showing the vein between well defined walls to be three feet in width. At a distance of 200 feet east of this shaft, on the same vein, another shaft has been put down to the depth of nine feet. The first five feet passed through clay, when rock consisting of spar and quartz was reached. The four feet of sinking in the rock showed the vein to a width of six feet. Work was being done in this shaft at the time of my visit.

On the north vein, which is now designated the main vein, and nearly opposite the first shaft, a third shaft has been sunk to the depth of 30 feet, exposing the vein to a width of 10 feet, but the full width had not yet been determined. The mineral has been followed from the surface to the bottom of this shaft. Work had been suspended on this shaft for two months, and it was partly filled with water. At this time about 20 tons of high grade ore had been taken from the mine.

Since writing the above, a recent note from Mr. Hugh Munroe, Crown timber agent at Port Arthur, informs me that a shaft has been sunk to a depth of 25 feet, with a showing that is really good. He states, "I saw ore that would assay $7,000 per ton."

I have been informed that the main vein has been traced by surface working a distance of three miles east and 1½ miles west.

COPPER.

In the early part of June I visited a property formerly owned by the Montreal Mining Co. on Point Mamainse, which is on the east shore of lake Superior, about 60 miles in a northwesterly direction from Sault Ste. Marie, and I spent some time in examining a part of it. It consists of two locations, one known as the Sand Bay location, comprising 6,400 acres, and the other as the Pancake Point location, comprising 4,800 acres; a total of 11,200 acres. The property has passed into the hands of Detroit capitalists, who hold it by option, and they are engaged in doing development work under the direction of Captain T. H. Trethewey, who has had extensive experience in mining. It may be of interest to submit an extract or two from the report of this property, which Mr. Trethewey, after careful exploration made to Mr. H. S. Sibley, trustee, of Detroit. The description he gave is as follows: Copper locations on Point Mamainse.

Description of the properties.

"The formation is that of the copper bearing series, being identical with that of the Keweenaw copper-bearing rocks, and no doubt will prove a continuation of the same, consisting as it does of an enormous development of beds of alternating amygdaloid, trap, conglomerate and other allied rocks. It commences at a point on the shore of lake Superior northerly from the north boundary of Sand Bay location, and forms a chain of high hills about 3½ miles wide extending in a southeasterly direction to and beyond Pancake river, and includes also the northeasterly portion of Pancake Point location, the southerly portion being of the same formation but low and flat. The amygdaloid beds are from 3 to 20 feet thick, the trap beds from 10 to 300 feet thick, and the conglomerates range from 400 to 500 feet or more in thickness. The latter contain water-worn quartz boulders and pebbles, varying from that of coarse sand to boulders 15 inches or more in diameter. The conglomerates in which native copper occurs have not these large boulders, but are from 4 to 14 feet in thickness. The strike of these beds is from the northwest to the southeast, and they dip at an angle of 20 to 30 degrees to the southwest towards and under lake Superior, similar to the Keweenawan series on the south shore; but further inland they may be more tilted, as the beds from which I took the dip were on the lake shore.

The occurrence of copper in veins.

"Copper occurs in this region in different forms of deposit. First, in true fissure veins from three to ten feet wide, which have a north and south strike, and an easterly dip sometimes cutting the formation at an angle of 45 degrees and generally faulted, the foot wall having a lateral thrust southward. The gangue consists of earthy calcareous spar, fluor spar, druzy quartz, epidote, chlorite and brecciated fragments of the adjoining rock, in which is concentrated not only native copper but in some of these lodes copper pyrites, copper glance, green carbonate, red oxide, black oxide and native silver. Sometimes the latter is associated with the native copper; at other times it occurs on a branch of the vein entirely separate from that carrying copper. The copper glance gave by assay eight ounces of silver to the ton of 2,000 lb. Secondly, in entirely or partially filled cavities in the amygdaloid beds, and it is reasonable to expect that where the lodes intersect these copper-bearing beds rich deposits of copper will be found not only in the veins but extending for a considerable distance into the beds on each side, and following their dip, as often occurs in the copper mines on the south shore. Thirdly, in small masses and sheets lying between the trap and conglomerate beds as a cementing material, or a portion of a cementing material, occuring as a matrix in some of the conglomerates similar to that of the Calumet and Hecla mines in Michigan.

Course of the veins.

"In following the formation northward from Sand Bay location veins occur, the direction of which conincides with that of the strata; but dip at a different angle, characteristic of those of the Ontonagan districts.

"In following the trend of the strata inland, southeasterly from Sand Bay, it is found to swing round more to an easterly and westerly direction. The veins cut the formation nearly at right angles. Their course is generally marked by a deep depression through the hills similar to that of the Cliff and Central mines in Michigan. Very few outcroppings are seen, the adjoining rock and *debris* having covered them. Small creeks often follow the course of these veins. In these I have found outcroppings which generally showed native copper in small particles, as well as larger pieces up to five inches, from which I have broken specimens with the use of an axe or small pick . .

On the Huronian border.

"At the northeasterly corner of Sand Bay location, about one mile southwest from the corner post, the Huronian slates come in, having a dip to the southwest; they probably underlie the copper-bearing rocks. There quartz in veins occurs, the quartz being copper stained and likely to carry gold and silver. Granitic and syenitic rocks occur further to the northeast . .

"Sand Bay would in all probability be headquarters, where an office, boarding-house and two dwelling houses erected in 1883 are still in fair condition."

These buildings were being used at the date of my visit for the convenience of the manager and the workmen. A force of ten men was employed, and during the month of May the expenditure for work and material was about $450. The principal work being done was boring with a diamond drill. Test borings had been made on four different veins, aggregating a total of 723½ feet, as follows: Diamond drill exploration.

No. 1,	boring	82½ feet deep.
No. 2,	"	110 "
No. 3,	"	50 "
No. 4,	"	77 "
No. 5,	"	99 "
No. 6,	"	123 "
No. 7,	"	172 "

After the close of the year Mr. Trethewey sent on to me a further account of the work done on this property in which he states:

"As to the progress of operations in this location during the past year, I would say that in December, 1891, an exploring party was placed at work with a diamond drill to demonstrate the character of a number of veins known to exist, and which displayed favorable superficial indications. After drilling over 3,600 feet at various points, several of which showed native copper, gray and other ores, the one presenting the most encouragement was selected and it was decided to sink a shaft to fully demonstrate the strength of the vein to a depth of at least 500 feet. The drill core obtained at a depth of 41 feet contained native copper ores of considerable richness. Accordingly during the autumn of 1892 a plant of machinery necessary for the sinking of the shaft proposed was erected at the vein, including a four-drill air compressor, double cylinder steam hoisting engine, boiler, etc., since which time the shaft has reached a depth of 52 feet. For over 40 feet of this the vein has produced copper of exceptional richness, both in native copper of sheet, small mass and heavy shot form, as well as quite heavy gray ore, an assay of which yielded 34 per cent. of copper and 14.7 ounces of silver per ton. The vein also shows small quantities of native silver. It is expected that the other veins which displayed copper in the cores of the diamond drill will receive attention during the coming season, but of course the main efforts will be concentrated upon the vein which the limited amount of sinking done proves to be so richly charged with copper. Sinking a deep shaft on the vein.

"It may be of interest to add that the cost of the diamond drilling here, which was in conglomerate, amygdaloid and trap rocks, was $1 92 per foot, which includes the entire cost of buildings, cutting roads, diamonds, etc., everything except the drill itself." Cost of diamond drilling.

COPPER AND NICKEL.

Early in June when I visited the Copper Cliff mine there were about 400 men employed by the company. The new rock house had been completed and the mine was being extensively worked. Canadian Copper Co's. works.

The shaft in this mine, with an incline of 40 degrees, has reached a depth of 700 feet, or about 500 feet vertical depth. Extensive stopes have been done near the surface and down to the first level, 58 feet from the surface. The second level is 40 feet below the first, and has been run for a considerable distance in good ore. The third level is 83 feet below the second and has been run in 100 feet. The fourth level is still 82 feet lower, in which several large stopes have been made and run in 120 feet. The fifth level, which is 65 feet below the fourth, has been run in 180 feet and several stopes Copper Cliff mine.

made. The sixth level, at a depth of 87 feet from the one above, has been run in 250 feet, but little stoping has been done. The lowest level is 86 feet below the sixth, and has been driven in to a total distance of 360 feet and passes through a fine field of ore.

The smelters were run to their usual capacity until within two months of the end of the year, when they, with the work in the mine, were closed down.

The Evans mine.

On the 2nd of July I visited the Evans mine and found 75 men employed, under the efficient direction of Captain Alfred James. The shaft was 220 feet deep. Work had been extensively carried on in the open pit and the three levels below it. A considerable amount of ore was being taken out and the whole work in connection with the mine was being done in a workmanlike manner and proper attention paid to the comfort and safety of the workmen. About the middle of September I again examined the mine and herewith give a more detailed description of the work, as it brings it up to a later date.

Open pit workings.

In the open pit mentioned above, work was being done by 7 men in stoping, trimming and removing rock, and scaling ground. A fine ore body was exposed in the northerly part of the pit of about 30 feet in width, and extending from the bottom to the surface. On the east side of this large excavation there is an extensive field of copper ore, carrying but little nickel. The ore in this mine is sorted into three classes and treated separately, viz: Pure nickel ore, carrying but little copper; pure copper ore, carrying but little nickel; and the nickel and copper combined. The ore is taken back on the tramcars to the hoist shaft and raised to the rock house. Work will be continued in this open pit.

Second level.

A second level, which is 40 feet below the first, has been run in north 100 feet, in which large stopes have been made extending upward to within 20 feet of the floor of the first level. A large centre pillar of ore and side pillars have been left to support the roof of this part of the level. Another drift south has been run in 30 feet, in which stoping has been done, commencing at the shaft and extending back some 20 feet, leaving the opening about 12 feet wide and 12 feet high. The remaining part of this drift is in lean ore or barren rock.

Third level.

Forty-eight feet below the level No. 2 a third level has been run in north 100 feet. Extensive stoping has been done extending 40 feet in width and 30 feet in height, or within 18 feet of the floor of level 2. Three pillars of ore are left as supports in this working. A large body of ore remains in sight in this drift. A south drift has also been run in for 50 feet and an extensive stope made 30 feet wide and 30 feet high, being arched over in the centre for support.

Fourth level.

Level No. 4 is down 57 feet below No. 3. A north drift has been run in 40 feet, and but little stoping done. A south drift on the same level is run in 20 feet, with considerable overhead stoping done. There is a fine showing of ore in this drift.

Fifth level.

The shaft has been sunk to the total vertical depth of 270 feet, and a fifth level run in which is 50 feet below the fourth. Work in this level consists of a north drift extending 18 feet, with stoping just commenced. A south drift has also been driven in 18 feet. A pump has been put in this level of sufficient capacity to lift 150 gallons of water per minute to the reservoir in the third level, at which place another pump of equal capacity makes the water discharge at the surface.

Machinery.

Drilling is done principally by machinery. The Rand air compressor operates the drills and is capable of running seven. The double machine has capacity to run fourteen drills. About 120 tons of ore are taken out in 24 hours. The ore, when sorted, crushed and screened, is conveyed by railway to the roast beds near the smelters at the Copper Cliff mine. There are two boilers

of 50 h. p. each and two of 70 h. p. Three are in constant use and one is held in reserve. The hoisting engine is 150 h. p. and two drums attached. The hoisting is done exclusively on the day shift. Two men are usually employed during the night in putting everything in proper shape for work in the morning. The crushing engine is 50 h. p.

Buildings.

The buildings consist of a shaft and rock house, engine-room and boiler-house, changing-house, blacksmith shop, office and warehouse. A boarding-house is conveniently arranged with 18 sleeping apartments and a large sitting-room. Three double frame dwellings with five other residences have been provided for the workmen. I gave direction that a frame that could be temporarily removed when necessary should be placed around the engine and belting in the rock-house.

About 1,800 cords of wood were on hand, obtained from the timber near the mine.

School accomodations for the children are obtained at Copper Cliff, where a good school is maintained. A Sunday school and religious services are conducted on Sabbaths in the large dining-hall of the boarding-house. Daily mails come to Copper Cliff, a mile distant.

The Stobie mine.

In the latter part of June I examined the Stobie mine, when a force of 36 men were employed under Captain Bluett. Work in the open pit was being vigorously carried on, which is now about 85 by 100 feet at the surface and has reached a depth of 70 feet, narrowing as it goes down to the present place of working. The work will continue both in stoping and sinking in this pit, from which about 100 tons of ore are being lifted daily. The adit level, 6 by 8 feet, has been run in 85 feet in a southwest direction, with a large stoping at the entrance. As the rock formation is firm no timbering is required.

Machinery.

Two steam drills were in use, one in the open cutting and the other in the drift. In addition to these, three air compressor Ingersoll drills are used. The hoist is a steam derrick. The bucket holding 1,200 lb. of ore is dumped into a car and run out on a tramway 120 feet to the rock-house. It passes into the Blake crusher, which is capable of crushing 150 tons in ten hours. It is then screened and the three grades, fine, raggins and coarse, taken to the roast beds at Copper Cliff for calcining, a distance of nine miles. About six cars are loaded daily, being about two-thirds of the entire quantity of ore treated in the two smelters. Three 20 h. p. boilers and engines are used separately for running the drills, hoisting the ore, and crushing and screening it.

Exploiting the ore body.

In addition to the large body exposed, the ore has materially improved in the percentage of nickel. The deposit of ore has been traced along the rise and top of the hill in a southwest direction for a distance of 500 or 600 feet. Several test openings have been made along the lead passing through the gossan, showing fine bodies of nickel ore.

A large quantity of wood is collected at this point and three cars, say about 37 cords, are taken daily to the roast beds and Copper Cliff mine.

Buildings.

Besides a comfortable residence for Captain Bluett and family, there has been erected a good boarding-house and all other suitable buildings for the work.

The whole is under the general management of Mr. John D. Evans, who resides at Copper Cliff.

The workings at the mine present a neat and safe appearance, with the exception of a projecting rock over the mouth of the adit which I directed should be removed.

Progress of operations.

In September when I again visited the mine the workings in the open cut had been extended westward under the hill to a distance of 30 feet from the perpendicular wall and to the length of 70 feet. As the work would be

extended in this direction it would be necessary to leave substantial pillars of ore to support the rock roof. On the east side of the large opening a skip roadway was being cut through the rock, over which the ore could be taken out of the mine and conveyed to the new rock-house which was then being constructed by the side of the railway track. The southwest drift has been extended to the distance of 172 feet from the entrance and running in the direction to reach the ore bodies as shown on the surface, as described before. Apparently there is an extensive field of ore in the mine, and of much richer quality than that obtained in the earlier working of the property. A new engine-house had been built and two new boilers set up of 75 h p. each, with the engines which are intended to give the motor power for all the machinery at the mine.

A recent note from the captain of the mine informs me that the drift has been extended and a raise made opening the ore bodies on the hill.

H. H. Vivian Company.

The Murray mine.

I inspected the Murray mine (property of the H. H. Vivian Co.) on the 28th of June. It had not been worked from the middle of October last to the end of April. The southwest drift in shaft No. 6, at a depth of 60 feet from the surface, had been run in the entire distance of 165 feet, and large stopes had been made in it. Due west of the shaft 35 feet, a winze was being sunk to reach the level below, which was 20 feet deep. The northeast drift had been extended to the entire distance of 250 feet, in which extensive stoping had been done. The north drift at the bottom of the shaft, which is 100 feet deep, had reached the distance of 35 feet, and the small drift mentioned in the former report starting from about the middle of this drift had been run in 35 feet. Another shaft had been started on the opposite side of the railway track at a distance of 400 feet from the former one, in a northwest direction, and had reached the depth of 25 feet.

Extension of mining work.

Work of the smelting furnaces.

The two smelting furnaces, of 50 tons capacity each in 24 hours, were running about 45 tons of good ore daily. The coarse matte produced from the ore is bessemerized and shipped to Swansea, Wales. As shipped the matte is raised to about 40 per cent. nickel and 20 per cent. copper. About four car loads of 15 tons each of Pennsylvania coke was being used weekly, or about eight tons daily. With duty and freight combined it can be laid down more cheaply than the Nova Scotia coke. Cars are loaded at the coke ovens in Pennsylvania and unloaded in the coke house at the mine.

Bessemerizing the matte.

Three boilers and three engines aggregating 100 h. p. were in use, one of 60 h. p. and the others of less capacity. The largest one is used for injecting the air through the metal in bessemerizing it, a process which occupies an hour and a half for each charge of two tons. It is then emptied out into pots where the nickel settles to the bottom and leaves the slag on the top, and when cooled in the pots and taken out the slag is easily broken from the metal. About one-quarter ton of fine matte is contained in each pot. A sufficient supply of ore was on hand to keep the smelters running for three months.

Cordwood fuel.

I was informed that 5,000 cords of wood are consumed annually in the smelting department, including the roasting. An area of 500 acres of wood land is cleared annually to supply this department of the work. The rapid consumption of wood will at not a distant date place these mining companies dependent upon the C. P. R. for bringing in fuel.

Management.

Mr. Harry Edwards has the full charge of the smelting department, in which about 70 men were employed. Mr. H. Lidgey, of Swansea, Wales, is general manager, having recently removed with his family to the mine.

September inspection.

In September I was again at the mine and examined the whole of the underground workings. Percy McNulty, the foreman, had under his charge 30 men who were divided into day and night shifts. Work was being carried on extensively in the first level of shaft No. 6, and in the lower level a small force was working in excellent ore. About 75 tons of ore were taken out daily, and when

sorted about 60 tons were fitted to go to the roast heaps. A good rock-house was built and a 10 h. p. engine was used for hoist. Four air compressor drills were in use. The shaft was neatly and substantially timbered and a convenient ladder-way of 12 feet rests extended to the bottom of the shaft. I gave direction that this should be properly walled off from the part of the shaft in which the hoist cage was used.

In the smelting department a new furnace, specially designed by Mr. Edwards to meet the need of the ore and the work, of 140 tons capacity in 24 hours, has been put up and it was expected to be in operation in about ten days.

When the present smelters are continuously running about 60 tons of ore are treated in 24 hours On account of the short water supply previously there had been a temporary suspension of smelting, but the furnaces were running to the full capacity at this date. The bessemerizing process was satisfactorily continued, raising the standard of the matte for shipment to 40 per cent. nickel and from 20 to 25 per cent. copper.

A new and convenient office has been built at the smelter, together with a shop for repairs containing lathe, drill, etc.; also a new coke house of 500 tons capacity.

Improvements.

An important improvement has been made in the tramway which leads out to the roast beds, in providing suitable turntables at each branch track whereby the ore can be dumped upon the roast heaps. One turntable is used for two roast heaps, the beds being on both sides of the main track. Thirteen turntables were put in, supplying 26 roast beds. The same are used to return the roasted ore to the smelter. A convenient weighing-house is built over the tramway and all the crude ore is weighed as it is run out to the roast heaps, and the roasted ore reweighed as it is returned to the smelter.

Dominion Mineral Co.'s works.

On the 27th of June a force of 170 men were employed at the Blezard mine (the Dominion Mineral Company's property), 60 of whom were doing underground work. They were chiefly engaged in removing the rock roof over the first level, and removing some of the pillars which had been left to support it. The work, although somewhat hazardous, had the advantage of being in full daylight, and was apparently being done with care. A few men were engaged in stoping in the bottom level in shaft No. 1, in which no additional sinking has been done. Shaft No. 4, or the new shaft, at a distance of about 50 feet north from the open pit, had been put down an additional 30 feet, and a 30-foot drift in a northeasterly direction had been driven in. At this time about 150 tons of ore was being taken out daily from the mine, crushed and screened, and sent to the roast beds.

The Blezard mine.

First inspection.

Management.

Captain Robert A. McBride, formerly of the Worthington mine, had charge of the work in this mine, and Mr. Ian Cameron of Glasgow, Scotland, had the general management of the company's works, having entered upon that duty on the 15th of March last. Mr. Cameron has had large experience in mining, and he has also been engaged in refining nickel in England, Scotland and Germany.

Serious accident at the mine.

In the early part of September, in company with the Director of Mines, I revisited this mine on the occasion of the accident which resulted in the death of five men and the injury of two others, on which a special report has been made to the Commissioner of Crown Lands. On a careful inspection of the open pit where the accident occurred, the Director of Mines fully concurred with me that no further work should be done on the floor of this opening until the entire remaining roof was removed and the pillars sustaining it were taken down, excepting that part of the roof supported by the large pillar through which the shaft passes to the deeper workings of the mine, a decision which the manager of the mine himself had arrived at. This huge pillar itself, by the blasting around it, showed some places of seam or

broken formation at the sides, and we ordered that firm additional supports should immediately be put in proper position to render it entirely secure. I gave written instructions as to what should be done to make the whole of the work safe, and the manager said they should be complied with at once.

State of the mine at the second inspection.

At this time no additional sinking had been done in shaft No 1, which was something over 170 feet in depth. The floor of the open level at the place of the shaft is 69 feet from the surface. A second level at 30 feet below the floor of the open level had been run, but was in disuse. At a greater depth of 85 feet from the floor of the first level the third or bottom level was run in about 60 feet southeast, which is known as the southeast level. A large stope was made in this drift 25 feet wide, and about the same in height, in the centre of the arch. A cross-cut is run in from this drift at a distance of 45 feet from the shaft, and extending upwards. A drift on the north side of the shaft has been run in 35 feet, but no stoping done in it. A sump is placed in this drift near the shaft, and a pump to hoist the water to the surface. This was the principal place of working in the mine at that time.

In September the new shaft had reached a total depth of 95 feet. At 81 feet from the surface a drift of 16 feet had been run in, and it was intended to extend this drift to connect with the main workings near shaft No. 1. This shaft was properly timbered and a suitable frame put in for a cage hoist. It will become the main working shaft of the mine. One hundred and sixty men were employed at this date, and about 15,000 tons of ore were on band, together with 250 tons of matte.

The Worthington mine.

The Worthington mine is also owned by the Dominion Mineral Company. Although operated to a limited extent formerly, it has had a considerable quantity of high grade ore taken out. Work had been suspended for some time, but was again resumed on a fair scale during the latter part of the year and with most encouraging results. A body of exceedingly rich ore has been discovered in one of the shafts, which is said to be the most valuable of any nickel ore found in that district in quantity. About 50 men were employed on the mine at the close of the year. The company may regard it as practicable to place smelting works at this mine at not a distant date, as large shows of ore are being opened up.

Drury Nickel Company.

The Chicago nickel mine is in the township of Drury I inspected it on the 29th of June. For further description of location see former report. The mine and works are owned by a company of capitalists in the cities of

Chicago nickel mine.

Boston and Chicago, known as the Drury Nickel Company, with Mr. R. P. Travers as president. The capital stock is $500,000, with $120,000 paid up.

Extent of the openings.

A large open cut, the principal place of working, has been extended to the full length of 300 feet on the surface, and a fine deposit of clear ore is exposed of from 14 to 15 feet in width, with diorite foot wall. The ore deposit has increased in width about 20 additional feet, but is mingled largely with rock, say about one-half good ore. The width of the open cut at the surface is 20 feet, and at the bottom, at a depth of 40 feet, it is narrowed to 14 feet. The deepest workings have reached 70 feet and are in good ore.

Machinery and smelter.

Across the ravine, about 300 feet west from the present workings, a test pit has been opened which shows fine ore Four air-compressor drills are used in the mine, two Ingersoll and two Rand. The ore is lifted from the mine to the top of the rock house by two skips drawn by two 4 foot friction drums, which are run by a 60 h.p. engine. The ore when hoisted is dumped on the crushing floor in the top of the rock house. When screened the three sizes, fine, seconds and coarse, are dropped into chutes, under which cars holding about two tons each are carried over the trestle tramway and dumped on the roast beds. The tramway can easily be shifted from one roast bed to another.

The smelting house is a substantial structure 60 by 60 feet, with an annex 24 by 24 feet. Besides the furnace the plant consists of three converters, two blowers, one double cylinder air compressor, one 45 h.p. engine, two 85 h. p. boilers and two steam pumps. A set of Cornish rolls are used for pulverizing the quartz and other materials for lining cement.

The coke house is a good building 30 by 50 feet; but there is also a good machine shop and saw-mill with shingle mill attached for manufacturing all the lumber and shingles required for the company's purposes. The laboratory, 24 by 34 feet, is well fitted up, with Mr. Fred. Edwards in charge as assayist.

Management. Mr. R. P. Travers of Chicago was at the mine exercising a general supervision of the entire work. Captain Travers is superintendent, with Alex. Erwin as foreman. A full force of men was employed in the various departments of work.

Sheppard mine. A new nickel mine is being opened up about two miles north of the Blezard, called the Sheppard mine, on which a force of 40 men is employed, under the direction of Mr. E H. Davies, sinking a shaft and doing other development work. A good plant is in use, consisting of a 35 h.p. boiler and engine for hoisting, running a 7-drill Rand compressor, etc.

Macdonald mine. On lot 12 in the third concession of Denison, one and a half miles from Worthington mine and three-quarters of a mile from the railway, a property known as the Macdonald mine was worked part of the year with a force of 10 or 12 men.

Keewatin nickel property. About one and a half miles from Keewatin, on Lake-of-the-Woods, a nickel property has been discovered, and some prospecting work has been done on it. Openings on the surface have been made to a width of 75 feet and over a length of quarter of a mile. One opening was made 8 by 20 feet and 16 feet deep, from which about 30 or 40 tons of good ore have been taken out. Four men were employed in opening the property for five or six weeks. The property is owned by six persons residing in Rat Portage and Keewatin, and comprises 56 acres held in fee simple. Assays made by Mr. Hille of Port Arthur show the ore to be of good grade.

MICA.

Foxton's mine and works. Messrs. James Foxton & Bros. of Sydenham are working an amber mica property on lot 5 on the eighth concession of Loughborough with a few men. The vein had been opened at different places along the surface for the distance of 500 feet, with cuts at the respective depths of 10, 20, 25 and 45 feet. The mica extends over an area of 550 by 30 feet, from which about 30 tons have been taken out. During the two weeks previous to my visit in May about one ton per day had been mined. The place of working was from 10 to 15 feet down from the surface. About half of the mica obtained from the property is in large crystals, 10 by 12 inches. It is very tough, and commands $6 per pound, while the smaller size, 2 by 4 inches, is sold at 35 cents per pound. This property is two and a half miles from Sydenham. The market is reported as dull.

The large mica property owned by the Sydenham Mining and Mica Company has been lying idle during the year.

Smith and Lacey mine. Messrs. Smith & Lacy are still operating their mica property in the township of Effingham, county of Addington, with satisfactory returns of pure white mica.

Grant mine. The Grant mine is situated on lots 7 and 8 in the tenth concession of Loughborough, three and a half miles from Sydenham. It had been extensively worked in former years, but was idle in May.

The Amy and Folger mine.

The Amy and Folger mine is on lot 8 on the eighth concession of Loughborough, and is worked by Messrs. Folger and Williams. Six men were employed when I was at the mine in May, with Samuel Cordick as foreman. Mr Williams has the general management of the work. One opening had been made about 75 feet in length on the surface and worked to a depth of 30 feet. This vein can be traced on the surface for 200 feet and is 6 or 7 feet wide. The mica is found in the limestone and taken out in considerable quantity. The largest size is cut to 6 by 10 inches, but the greater proportion is in smaller sizes. Four men were working in this pit. A second working was newly made at 300 feet from the former one. The surface had been opened for 30 feet and worked to a depth of 15 feet in broken formation, and the rock and mica were being removed chiefly by picks. The mica is hauled to Sydenham and sold to the Thompson, Houston Co., and is put up in the cutting works in the town.

Truesdale mine.

The Truesdale mine is on lot 8 in the third concession of Loughborough. Three men were employed, and the work had been continued for the past nine months. It gives promising returns.

Sterling mine.

C. I. Sterling of Kingston is operating a mica property on lot 16 of the ninth concession of Loughborough, about seven miles northeast of Sydenham. The mine had been worked for about a year and a half, but had been suspended for the three months previous to my visit. A shaft had been opened 7 by 7 feet at the surface, which widened as it went down to 18 by 18 feet at a depth of 70 feet. It is about half filled with water. During three months of last year 50 tons of 80 per cent. phosphate and 10 tons of amber mica were taken out. In the present year, up to the date of my visit in May, 10 tons of high grade phosphate and 15 tons of mica had been mined.

Mica and phosphate.

The lead has been traced for over 300 yards, and three test pits have been sunk from 15 to 20 feet in depth. In one of these pits a vein of three feet width has been opened of excellent phosphate, which will be worked as soon as the market improves. About twenty other surface openings have been made along the lead, showing phosphate and mica. Hoisting is done by horse-power. This mine is about eleven miles from Murvale station on the Kingston and Pembroke Railway, to which the phosphate is hauled for shipment. The mica is taken to the cutting works in Sydenham.

PHOSPHATE OF LIME.

Wolf lake mine and other properties in Bedford and North Crosby.

W. J. Webster of Westport owns a phosphate property on lot 28 of the eighth concession of Bedford, situated on the border of Wolf lake. The hill rises to an elevation of 280 feet, with an incline of 30 degrees. On the hill side a shaft has been run in 15 feet, tapping a vein 7 feet in width of tough amber mica. About one ton had been taken out, and it was intended to push the work vigorously. If the market improves the work will be extended on the phosphate deposits, which have a favorable showing. Mr Webster has also obtained the following phosphate properties : Lot 21 in the tenth concession of North Crosby, being a continuation of the lead on the former lot described. On lot 19 in the second concession of North Crosby development work has been done, uncovering a vein of phosphate one foot in width for a considerable distance. On lot 29 of the ninth concession of Bedford prospecting work has been done, and 10 tons of from 65 to 70 per cent. grade of phosphate taken out. Also on lot 21 of the tenth concession of North Crosby limited prospecting has been done, showing a good opening of high grade ore.

Work at the Opinicon or Rock lake mine was being still carried on under the control of Neil Cochran with a force of 25 men at the time of my visit in May. Charles Pine of Westport was acting as shipping agent. The larger

opening described in my last report at 150 feet depth has been sunk now to the depth of 225 feet. About 150 tons of 75 per cent. ore are being taken out monthly; 800 tons were on hand at the mine. A self-dumping car of one ton capacity is used in raising the ore. A new boiler and engine of 50 h p. are now used for running the steam drills, hoisting the ore and working two pumps to keep the mine free from water. I directed that the ladderway should be placed on the west side of the pillars, which are left to sustain the hanging wall of the mine, as the workmen would then be entirely free from danger when going in and coming out of the mine; also, that an open unused pit near the roadway should be properly fenced. Otherwise the mine was in a safe and workmanlike condition. Opinicon or Rock Lake mine.

Lake Opinicon mine is situated in the township of Bedford, and comprises 1,750 acres. It is owned by Mr. Swift of Ottawa, W. H. Davis of Buffalo and others, but the company's organization has not yet been perfected. Eight men besides the foreman, William J. Shales, were working at the mine. It was stated to me that a large force of workmen would be put on when the company was properly organized, which was expected to be accomplished at an early date. The mine had been worked two months in the previous year, and constantly since the beginning of April last. A shaft had been put down 48 feet, and an opening made following the lead for a distance of 136 feet, varying from 2 to 25 feet in width. Eighty tons of 85 per cent. phosphate had been taken out; 45 tons were on the dock ready for shipment, and the remainder was at the mine. A boiler and engine of 30 h.p. were used for hoisting and for driving two steam drills. An engine-house, derrick, stabling and cobbing house have been built. The ladders going into the shaft were in an imperfect condition, so I gave instructions to have these properly placed, secured and walled off from the hoisting part of the shaft. Lake Opinicon mine in Bedford.

The Foxton mine, the Concession mine, the Johnson mine, the Eagle Lake mine, the St. George Lake mine, Silver Lake mine and Crow Lake mine were all lying idle. Mines lying idle.

Mr. William Davies of Perth, a gentleman largely interested in mining operations, and a dealer in mining lands, informed me that nothing was being done in that vicinity when at his place in the last of May, except a little prospect work for mica, and that but little work would likely be done until there was a change in the market. The Perth district in Lanark.

Mr. Sterling owns the Coe mine on the west half of lot 5 in the ninth concession of Loughborough, near Gould lake, three and a half miles from Sydenham. This property had been extensively worked formerly. Last year's output realized 65 tons of 80 per cent. phosphate and 70 tons of second quality, besides a small quantity of excellent amber mica. The force employed was 8 men, with Mr Samuel Cordick as foreman. If markets improve, work will be resumed at once on this property for both minerals. Coe mine. Phosphate and mica.

The Otter mines are situated on lot 9 and the east half of lot 11 in the seventh range of North Burgess, the former containing about 200 and the latter 100 acres. These properties are about eight miles from the town of Perth, to which there is a good road, and about two miles from Rideau lake, on the line of the Rideau canal connecting Kingston and Ottawa, and are owned by Messrs. Cross & Foster of Smith's Falls Formerly extensive mining had been done on these lots, aggregating 2,000 tons of 80 to 85 per cent. phosphates, which have been sent to the market, with about 250 tons now on hand at the mines ready for sale. In addition, about 100 tons of amber mica have been taken out and sold. Mining has been suspended for the last nine months of the year on account of the dull state of the phosphate market. The mineral extends over a large area on the lots, and the work, which is done by contract, has been confined chiefly to surface openings at depths of from 10 to 15 feet. As no machinery The Otter mines.

Character of the workings.

has been used in lifting the ore or waste rock to the surface, a large amount of refuse has been left in the cuttings, and as a result, for convenience and ease these cuttings have been abandoned and new ones opened where the ore could more easily be obtained. The mineral occurs in true fissure veins, in more or less regular deposits in the veins, which are nearly vertical, and carry about one-half mineral and the remainder waste. With suitable appliances for lifting the material from the cuttings these veins may be worked to much greater depths, as there is no apparent failure of the mineral.

Rock formation.

The prevailing rocks are pyroxene, micaceous and garnetiferous gneiss, with some bands of crystalline limestones, being those in which the phosphate of lime or apatite is usually known to occur. The greater part of the rocks are covered with a thin deposit of boulders and clay. The veins vary in width from 12 feet down to a few inches.

Mica and phosphate.

On lot 9 there is a vein 10 feet wide of mica and phosphate, some of the deposits being nearly all mica, and others nearly all phosphate. Crystals of mica are obtained from 18 inches down. At some of the places where the mica is exposed it is twisted and broken so that only from 15 to 20 per cent. would be suitable for electrical purposes.

Mr. R. Brodie of Smith's Falls, through whose courtesy I have obtained the description of the Otter properties, states: "As far as I know none of the phosphate mines in the Burgess and Perth districts are being worked this winter. There is something being done at mica. I am informed that Mr. Waters of Ottawa has bought lot 13 in the sixth range of North Burgess, a mica property, and he has a gang of men at work putting in a boiler and engine and some pumping and hoisting machinery, and also laying in a supply of wood."

The superphosphate works at Smith's Falls

Mr. Brodie, manager of the Smith's Falls superphosphate works, writes me regarding them as follows: "We fitted up our sulphuric acid plant with pyrites burners the past year. We still keep the sulphur burners so that we can use either pyrites or brimstone. We have also made some additions in our buildings and machinery, and are now well equipped for grinding and manufacturing phosphates and fertilizers. Our business increases every year."

GYPSUM.

The Merritt mine.

For two months during midsummer the Merritt mine (inadvertently designated the Glenny mine in my last report) was lying idle, but at the date of my visit in December 13 men were employed in the mine and at the mill. The mill had been operated for most of the year, treating about 5 tons of calcine or 12 tons for fertilizing uses in 10 hours. It had been shut down for a couple of weeks, undergoing repairs. The workings in the mine were chiefly carried on in the old openings, and in the usual way of mining the gyysum along the tramway, filling in the open space with the waste rock and moving the tramway again up to the breast of the gypsum. The ore is removed from the mine in the same way as described in the former report.

Output of gypsum.

About 1,200 tons were taken out during the year; 200 tons have been taken to Port Colborne to be used in smelting nickel ore, but the result has not yet been determined. About 300 tons of ore were on hand in the rock house. This mine is not troubled by the inflow of water from the Grand river, the principal workings being in dry rock. Some of the timbers in the old drifts have become defective by decay, leaving parts of the mine in an unsafe condition.

State of the mine.

Mr. Glenny, who still has the charge of the mine, stated that the whole of the work would be properly renovated at the first of the year, and any portion of the timbers which were defective would be replaced by firm new supports. I directed however that on one of the drifts the repairs should be done at once, and that work should be suspended until the drift was put in a safe condition. The mining is still done by contract.

But limited work has been done on the Teasdale property during the year. The drift has been run in 100 yards, and a large body of gypsum opened, but the inflow of water from the river has entirely suspended operations. A wind-mill has been put up over the drift and near the end to drive a pump, but so far it has not proved effective. A small shipment of plaster had been made recently to the Alabastine Company at Paris. There may be at an early date suitable machinery provided for keeping the mine free from water, and for working the large body of ore. In December when in the mine I found the drift neatly and substantially timbered. The work was under charge of Mr. Walton. Teasdale mine.

The Glenny mine, which was designated the Merritt mine in the last report, has not been worked during the year. Idle mines.

The Mount Healey mine is still idle, as are also the Excelsior mine and mill.

An average force of six men has been working during the year in the Martindale mine, but only two men were employed in October when I inspected it. The workings were in a greatly improved condition, and considered safe at the place of working. Very extensive openings have been made in the older workings, which are not now used, and as the work advances the walls are made secure. About 500 tons of plaster have been taken out during the year. The mining is done by contract at 75 cents per ton. The mill of 10 tons daily capacity is running part of the time, grinding plaster for fertilizing purposes. Martindale mine.

At the date of my visit to the Garland mine in December three men were employed, including Captain Wm. Smith, who has charge of the work. The force of workmen would be increased after the holidays. About 9 or 10 tons of plaster were mined and hauled out to the mouth of the drift daily The drifting had been continued to the full distance of 152 yards, and the principal place of working was near the extremity of the drift. As the ore is removed the tramway is moved nearer to the workings and the open space walled in with waste rock The interior of the mine was in a good state of repair. The defective timbers have been replaced by new supports. A shaft has also been opened near the present workings, a depth of 52 feet from the surface, which is used for going into and coming out of the mine, as well as for ventilation, which is good in the mine. I advised that a suitable space or man-hole for refuge be made in the long tramway for safety. The Garland mine. Improving its condition.

The ore taken from the mine is still hauled to Caledonia and ground as a fertilizer in the mill of Messrs. Hull & Olds. Several car loads of gypsum have been sold during the year, to be used in stables as a disinfectant and absorbent. The property has again passed into the possession of Mr. Nicholas Garland of Toronto, the original owner, and whose name the mine bears.

On the 22nd of December I was at the Paris mine property, and found two men engaged in running in a new drift at a distance of 100 feet west of the old one. It had been extended about 100 feet and would reach the bed of ore at the further distance of from 50 to 75 feet. This new drift was being made through the old waste rock left in the earlier working of the mine, and was being substantially timbered and of sufficient height to work a horse or mule in hauling out the ore. This drift would be completed in about a month's time, when the work of taking out gypsum would begin. The quantity of ore taken out of the mine in the early part of the year reached 650 tons, which was ground in the company's mill at Paris for farm use. It is claimed by some that the gray is of more value as a fertilizer than the pure white plaster. The mill is chiefly supplied with ore for alabastine from the beds of white gypsum below Cayuga. Seventy-five tons however were brought from Grand Rapids, Mich., to meet the demand for Paris mine and works. Land plaster. Manufact re of alabas

the year. At the time of my visit about three tons were being manufactured into alabastine daily, with a force of 10 or 12 men employed in this department of the company's work. The mill has been refitted and now has a much increased capacity, and is in a good condition every way to turn out an excellent article. This is the only mill engaged in the manufacture of alabastine in the Dominion, and the third one in the world, the other two being, one at Grand Rapids, Mich., and the other in London, England. Mr. B. M. Church of Grand Rapids, who has devoted a great deal of time in perfecting the manufacture of alabastine, is president of this company. He also is the largest stockholder and managing director of the Grand Rapids Company, and he owns a half interest in the company in England. Mr. T. W. Wheeler has still the charge of the company's works at Paris, and he controls the entire operations in Canada. The demand for alabastine is rapidly increasing, as its value becomes known as a pure and wholesome article for the beautiful and substantial decoration of walls and ceilings in dwelling houses.

I was told by Mr. Wheeler that shipments during the year had been made to almost every part of the Dominion, and that a very much larger supply would be required to fill the orders for the coming year.

MINING ACCIDENTS.

Two mining accidents occurred during the year, both of which were at nickel mines in the Sudbury district.

Accident at the Evans mine.

The first of these took place at the Evans mine on the 26th of April, which resulted in serious injury to Andrew Sorin, an employe of the Canadian Copper Company. According to the statements of two fellow-workmen he was engaged as a machine helper in sending machinery down the shaft, being at the time on the fourth level, and having heedlessly stepped out into the shaft the cage came down upon him. It was found that he was badly injured in the spine, and upon the advice of his medical attendant he was sent to the hospital at Toronto for treatment. According to the statements of the men at work with him every necessary precaution was taken to prevent accident, and the usual necessary signals were given before the cage was lowered.

Serious accident at the Blezard mine.

The second accident took place at the Blezard mine of the Dominion Mineral Company on the 6th of September, and resulted in the death of five employes of the Company and the injury of two others, one slightly. The particulars of this accident are given in a special Report made to the Commissioner of Crown Lands, under the provisions of section 65 of The Mines Act 1892.

A. SLAGHT,
Inspector.

Waterford, February 22, 1893.

SPECIAL REPORT ON THE ACCIDENT AT THE BLEZARD MINE.

To the Honorable the Commissioner of Crown Lands:

Special report to the Commissioner.

Sir,—I have the honor to submit to you, in pursuance of your instructions, a special report of the accident in the Dominion Mineral Company's Blezard mine near Sudbury on Tuesday afternoon, the 6th inst., which resulted in the death of five men, crushed beneath a mass of falling rock, and the injury of two others, one seriously but not fatally, and the other slightly. The names of those who were killed are:

List of the killed and wounded.

Duncan A. McDonald, an old miner, who leaves a wife and family;

John Johanson, a Finlander, who had been in the country only a few weeks, and who leaves a wife and two children;

Thomas Faulkner, who leaves a young wife to whom he had been married but two weeks;

A. Picard, single, a French Canadian, who had worked in the section of Sudbury for some years; and

Robert McKinley, single, aged 20 years, whose relatives reside in Ireland.

Damase Cadieux was seriously injured, but not fatally. He has a family. John Brothers was slightly hurt.

The first intimation I had of the sad occurence was on receipt of a telegram from Mr. Blue, Director of the Bureau of Mines, on Thursday, 8th inst., about noon, which was as follows:

"Accident in which five men were killed and two injured at Blezard mine. Better go up at once and investigate under provisions of section sixty-five, Mines Act. Procure plan of work where accident occurred. Answer."

The following reply was sent on same date to the Director:

"Will reach Toronto about ten to-night. Please meet me at station. Shall leave next train for Sudbury."

In our short interview in Toronto the Director informed me that you were absent from the city, and that he had been unable to reach you yet by telegram, but that he would communicate to me at Sudbury any instructions you might wish to give. On my arrival at Sudbury late on Friday, I went immediately to the coroner's office and carefully examined the evidence taken at the inquest, which had been held on Wednesday, the day after the accident.

I arranged with the coroner to procure a copy of the evidence for me, which I sent to the Director for you on the Sabbath following, being the first mail after I obtained it.

Visit to the scene of the accident.

On Saturday after my arrival at Sudbury I went out to the mine and met Mr. Ian Cameron, the general manager of the company, and Robert McBride, the captain of the mine, and they accompanied me to the place of the accident in the mine. I found nothing changed in the mine after the accident, otherwise than what was necessary in removing the bodies of the unfortunate men who had been killed. A considerable part of the day was spent in examining the location of the accident and taking necessary measurements with a view to procuring a diagram or plan of the same.

After my return to town late on Saturday the following telegram came to hand from the Director:

"Procure and send down by first mail copy of evidence taken at inquest. Commissioner directs you to take all necessary and proper measures, and make special report."

Immediately I wired answer to the Director as follows:

"Visited mine to-day. Utmost facilities given to investigate. Case serious, and perhaps more satisfactory if you come up and act with me. Will forward next mail copy of all proceedings at inquest. Answer."

The answer of same date received the following day reads:

"Will await evidence and may go up Monday night."

On Monday morning I went out to the mine again and spent the forenoon in further examining the place of accident and completing measurements, which, with the aid of the tracings of the mine kept in the office, enabled me to obtain the plans accompanying this report. Before leaving the mine I decided to return on Wednesday morning following and take all necessary evidence respecting the condition of that part of the mine when the accident occurred. This date was fixed to give time for the arrival of the Director should he decide to come up. Monday afternoon was spent at the Murray mine and on my return to town late in the evening the following message came from the Director:

"I expect to leave for Sudbury to-night."

Tuesday I was at Copper Cliff, but spent most of the day at the Evans mine.

Mr. Blue arrived at Sudbury late on Tuesday and on Wednesday morning we drove over to the Blezard mine and were occupied the whole day in examining the place of accident, confirming measurements and carefully inspecting the present condition of the mine, and in taking evidence of parties regarding the condition of the place when the accident occurred.

Those whose evidence was taken on the first day are the following, viz: Ian Cameron, general manager of the works: Robert McBride, captain of the mine; Alexander Wilson, foreman; Moses Austin, underground foreman, and Michael Giroux, laborer; all employed in the service of the Dominion Mineral Company.

Late on Wednesday evening the Director and myself returned to Sudbury, and as he could not go with me to the mine on Thursday I went out alone and took the evidence of the following parties, viz: Frank Blum, laborer; Peter Wilson, miner; and Thomas James McFarlen, laborer.

The whole of the evidence taken is submitted herewith.

Summary of evidence taken at the investigation.

I carefully looked over all the discharge papers in the office for the last six months, 121 in number, and I found 14 of the number reported as leaving on account of dissatisfaction. Thirteen of these men were engaged on above ground work. Wages was in most cases of the fourteen given as the cause of dissatisfaction.

I also obtained the statement of the manager of the company regarding the professional relation of the coroner who conducted the inquest to the company, which is herewith given.

The first plan submitted will show the position of the first level of the mine before any part of the rock roof was removed.

In my report of 1890 this part of the mine is described as follows, page 13: "Shafts 1, 2 and 3 are sunk to the depth of 69 feet to the first level, from which there has been taken 50,000 tons of ore. A number of stopes have left the opening or excavation in an irregular form about 150 by 175 feet at the bottom, and extending upwards to within 18 to 22 feet of the surface. The rock roof is well supported by four large pillars of ore, No. 1, 22 by 22, No. 2, 24 by 16, No. 3, 18 by 24, and No. 4, 22 by 24." The extreme distances were taken.

I also referred to this part of the mine in the report of 1891 as follows: "The rock roof over the extensive excavation referred to in my former report has been partially removed, showing a thickness varying from 18 to 27 feet, and a good view of the interior workings can now be had from the surface, which tends to confirm the previous description and proves the safety of the work at the date of my former report."

The second tracings show the present state of this part of the mine with the extent of roof still remaining. The tracing of the place of accident shows its state as nearly as could be obtained before the rock fell. The

distance from the floor of the excavation to the surface is 70 feet, with a hanging incline of 11 feet from being perpendicular. From the floor to the lowest part of the projecting rock which fell is 18 feet. The length of rock cleaved off is 19 feet, and from the upper part 33 feet to surface. It stretched across the pillar in width of say 10 feet and the extreme projection was 5½ of 6 feet, which would be about the middle of the projection and in cone shape.

General conclusions.

From the information which I have been able to obtain I am inclined to the view that ordinary care was taken in looking after the safety of the mine. It is quite certain that the projecting rock which afterwards fell was considered firmly attached to the wall by the parties whose special duty it was to examine it. Foreman Alexander Wilson, a man of several years' experience in mining, was present at the blasting down of the mantel and the remaining part of pillar No. 1 on Sunday previous to the accident, and after looking at it carefully himself he took the precaution to go out and get Duncan McDonald, an old miner, to inspect it also. McDonald was considered a man of good judgment, was often consulted about matters in the mine, was entrusted with the charge of a gang of men and was paid extra wages because of his superior experience as a miner. He pronounced it safe by saying they had made a good job of it. He also began work within a few hours afterwards directly beneath the projecting rock, and was there until midnight Sunday, and also worked Monday and Tuesday. Frank Blum, who worked with him that night, says in his evidence that "there was no conversation between McDonald and myself as to there being any danger, and I did not notice anything dangerous." Foreman Wilson often passed underneath the projecting rock, and was there but a few moments before it fell. The projection was in an exposed place to the light, the roof above having been removed for a great distance around, which gave the best possible opportunity to see any seam, or slip, or fault of any kind. If it had been under cover, or if any defect could have been seen, then it should have been tested by going up to it and examining it with hammer, pick or gad, or otherwise. The place where the accident occurred was in the open daylight, and from all the evidence obtained no one of the mining men who were working around spoke of it as a place of danger. The general manager of the company, Mr. Cameron, in company with Mr. McBride, the captain of the mine, spent some time in the open workings of the mine and in full view of the projecting work but a short time before the accident; they were there for the special purpose of looking over every part of the work, and were discussing plans for future operations in the mine. They did not regard the place as dangerous, and indeed were congratulating themselves upon the safe appearance of the mine.

In the evidence taken it was shown that when any projecting rock had the appearance of danger a man was lowered from the surface to test or remove the rock. This had been done repeatedly.

After the fall of the rock it could be seen that a seam or defect existed behind it, but it is by no means certain that it could have been discovered before. The presumption is that it could not have been seen, and that the defect was inherent.

I have the honor to be, Sir,
Your obedient servant.

A. SLAGHT,
Inspector.

Waterford, September 22, 1892.

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RETURN

To an Order passed by the Legislative Assembly on the 5th day of May, 1893, for a Return from the Treasurer of the Medical Council giving a detailed statement of the sums paid to each member of the Medical Council during the past five years, for travelling expenses and hotel accommodation while attending Council and committee meetings, and also of the details of the amount set down in the financial returns for 1890, 1891 and 1892, under the heading "Expenses of Legislation."

J. M. GIBSON,
Secretary.

Provincial Secretary's Office,
Toronto, May 12th, 1893.

RETURN

From the Treasurer of the Medical Council giving detailed statement of payments to members of the Medical Council for travelling and hotel expenses during the years 1888-92, inclusive, and expenses of Legislation for 1890-92.

SCHEDULE.

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PAYMENTS to members of the Council for hotel and travelling expenses.

Date.	To whom.	No. of days hotel allowance.	At $3.50 per diem.	Travelling expenses.	Total.
June 16, 1888.	Dr. D. Bergin	5	17 50	20 35	37 85
	" J. L. Bray	4	14 00	13 60	27 60
	" H. E. Buchan	Nil.	Nil.	Nil.	Nil.
	" J. H. Burns	Nil.	Nil.	Nil.	Nil.
	" C. J. Campbell	4	14 00	9 70	23 70
	" J. G. Cranston	5	17 50	20 00	37 50
	" H. W. Day	5	17 50	7 60	25 10
	" A. G. Fenwick	5	17 50	9 70	27 20
	" F. Fowler	5	17 25	11 00	28 25
	" W. B. Geikie	Nil.	Nil.	Nil.	Nil.
	Sir James Grant	3	10 50	20 00	30 50
	Dr. W. T. Harris	5	17 50	4 50	22 00
	" G. Henderson	5	17 50	9 50	27 00
	" J. Henry	5	17 50	4 50	22 00
	" G. E. Husband	4	14 00	3 00	17 00
	" Geo. Logan	4½	15 75	17 60	33 35
	" J. McArthur	5	17 50	9 70	27 20
	" V. H. Moore	4	14 00	15 00	29 00
	" R. B. Orr	5	17 50	2 00	19 50
	" D. L. Philip	5	17 50	4 50	22 00
	" J. W. Rosebrugh	5	17 50	3 50	21 00
	" J. Russell	5	17 50	5 00	22 50
	" A. Ruttan	5	17 50	10 00	27 50
	" Elias Vernon	4	14 00	3 00	17 00
	" J. A. Williams	4½	15 75	5 00	20 75
	" H. H. Wright	Nil.	Nil.	Nil.	Nil.
			356 75	208 75	565 50

PAYMENTS to members of the Council for hotel and travelling expenses.

Date.	To whom.	No. of days hotel allowance.	At $3.50 per diem.	Travelling Expenses.	Total.
June 15, 1889.	Dr. D. Bergin	8	28 00	18 00	46 00
	" J. L. Bray	6½	22 75	13 80	36 55
	" H. E. Buchan	5	17 50	.....	17 50
	" J. H. Burns	5	17 50	.....	17 50
	" C. J. Campbell	6	21 00	9 70	30 70
	" J. G. Cranston	7	24 50	18 75	43 25
	" H. W. Day	6	21 00	6 60	27 60
	" A. G. Fenwick	6	21 00	9 70	30 70
	" Fife Fowler	6½	22 75	13 00	35 75
	" W. B. Geikie	5	17 50	.....	17 50
	Sir James Grant	5	17 50	20 00	37 50
	Dr. W. T. Harris	5½	19 25	4 00	23 25
	" G. Henderson	6	21 00	8 25	29 25
	" J. Henry	5½	19 25	5 00	24 25
	" G. E. Husband	5	17 50	3 50	21 00
	" Geo. Logan	7	24 50	17 50	42 00
	" J. McArthur	6	21 00	9 70	30 70
	" V. H. Moore	7	24 50	15 00	39 50
	" R. B. Orr	5	17 50	2 50	20 00
	" D. L. Philip	5½	19 25	4 00	23 25
	" J. W. Rosebrugh	5	17 50	3 50	21 00
	" J. Russell	5	17 50	5 10	22 50
	" A. Ruttan	6	21 00	10 50	31 50
	" Elias Vernon	5	17 50	3 50	21 00
	" J. A. Williams	5	17 50	5 00	22 50
	" H. H. Wright	5	17 50	.....	17 50
			$523 25	$206 50	$729 75

PAYMENTS to members of the Council for hotel and travelling expenses.

Date.	To whom.	No. of days hotel allowance.	At $3.50 per diem.	Travelling expenses.	Total.
June 14, 1890.	Dr. D. Bergin	8	28 00	20 50	48 50
	" John L. Bray	7	24 50	13 80	38 30
	" Wm. Britton	5	17 50	Nil.	17 50
	" C. J. Campbell	5	17 50	9 30	26 80
	" H. W. Day,	5	17 50	9 10	26 60
	" A. G. Fenwick	6	21 00	10 00	31 00
	" Fife Fowler	6	21 00	11 00	32 00
	" W. B. Geikie	5	17 50	Nil.	17 50
	" W. T. Harris	5	17 50	4 50	22 00
	" G. Henderson	6½	22 75	8 25	31 00
	" James Henry	5	17 50	3 75	21 25
	" A. J. Johnson	5	17 50	Nil.	17 50
	" George Logan	6½	22 75	18 00	40 75
	" L. Luton	6	21 00	9 30	30 30
	" J. McArthur	5	17 50	9 25	26 75
	" V. H. Moore	7	24 50	14 00	38 50
	" W. H. Oliphant	5	17 50	Nil.	17 50
	" R. B. Orr	5	17 50	Nil.	17 50
	" D. L. Philip	5	17 50	4 50	22 00
	" A. F. Rogers	7	24 50	19 00	43 50
	" J. W. Rosebrugh	5	17 50	5 00	22 50
	" J. Russell	5	17 50	5 00	22 50
	" H. Ruttan	5	17 50	10 00	27 50
	" James Thorburn	5	17 50	Nil.	17 50
	" J. H. Williams	5	17 50	5 90	23 40
			$490 00	$190 15	$680 15

PAYMENTS to members of the Council for hotel and travelling expenses.

Date.	To whom.	No. of days hotel allowance	At $3.50 per diem.	Travelling expenses.	Total.
June 13, 1891.	Dr. D. Bergin	7	24 50	21 50	46 00
	" John L. Bray	6	21 00	13 80	34 80
	" Wm. Britton	5	17 50	Nil.	17 50
	" C. J. Campbell	6	21 00	9 30	30 30
	" A. G. Fenwick	6	21 00	9 30	30 30
	" W. T. Harris	6	21 00	4 75	25 75
	" G. Henderson	6	21 00	10 25	31 25
	" James Henry	5	17 50	3 50	21 00
	" A. J. Johnson	5	17 50	Nil.	17 50
	" J. W. Rosebrugh	6	21 00	4 50	25 50
	" Fife Fowler	6	21 00	11 00	32 00
	" James Fulton	6	21 00	9 80	30 80
	" George Logan	7	24 50	17 00	41 50
	" L. Luton	6	21 00	9 80	30 80
	" A. Ruttan	6	21 00	10 00	31 00
	" V. H. Moore	6	21 00	14 50	35 50
	" D. L. Philip	6	21 00	4 75	25 75
	" R. B. Orr	5	17 50	Nil.	17 50
	" James Thorburn	5	17 50	Nil.	17 50
	" W. B. Gerkie	5	17 50	Nil.	17 50
	" Henry W. Day	7	24 00	8 75	32 75
	" George M. Shaw	6	21 00	4 50	25 50
	" A. F. Rogers	7	24 50	17 00	41 50
	" W. H. Oliphant	5	17 50	Nil.	17 50
	" J. A. Williams	5	17 50	5 00	22 50
			$510 50	$189 00	$699 50

PAYMENTS to members of the Council for hotel and travelling expenses.

Date.	To whom.	No. of days hotel allowance.	At $3.50 per diem.	Travelling expenses.	Amount.
June 18, 1892.	Dr. D. Bergin	5	17 50	24 00	
	" John L. Bray	6	21 00	13 50	
	" Wm. Britton	5	17 50		
	" C. J. Campbell	5	17 50	8 20	
	" A. G. Fenwick	6	21 00	10 00	
	" W. T. Harris	5	17 50	4 00	
	" G. Henderson	5	17 50	9 00	
	" James Henry	5	17 50	3 00	
	" A. J. Johnson	5	17 50		
	" J. W. Rosebrugh	5	17 50	3 50	
	" Fife Fowler	5	17 50	13 00	
	" James Fulton	6	21 00	9 80	
	" George Logan	5	17 50	23 00	
	" L. Luton	6	21 00	9 80	
	" A. Ruttan	5	17 50	10 00	
	" V. H. Moore	6	21 00	15 00	
	" D. L. Philip	5	17 50	4 00	
	" R. B. Orr	5	17 50		
	" James Thorburn	5	17 50		
	" W. B. Geikie	5	17 50		
	" Henry W. Day	5	17 50	7 60	
	" J. Arthur Williams	5	17 50	5 00	
	" A. F. Rogers	5	17 50	23 00	
	" Thos. Miller	5	17 50	3 50	
	" E. Vernon	5	17 50	3 50	

ALL PAYMENTS made to members of the Council for hotel and travelling expenses in connection with Committees.

Cheque.	Date.	To whom paid.	Service.	Details.	Amount.
	May 15, 1889	Dr. Fife Fowler	Executive Committee	2 days' hotel, $7.00; travelling expenses $13.00	$20 00*
	" 15, "	" D. Bergin	" "	3 " " 10.00; " " 23.00	33 00*
	" 15, "	" Geo. Logan	" "	1 " " 3.50; " " 17.00	20 50
	" 15, "	" V. H. Moore	" "	2 " " 7.00; " " 14.50	21 50*
1895	June 15, 1889	" J. A. Williams	Select Committee	7th May, 1889, travelling expenses, $5.00	5 00
	" 15, "	" J. A. Williams	" "	15th May, 1889, hotel, $3.50; travelling expenses, $5.00	8 50
1966	Oct. 19, "	" H. W. Day	Discipline Committee	6 days' hotel, $21.00; travelling expenses, $17.95	38 95
7	" 19, "	" J. Russell	" "	5 " " 17.50; " " 13.50	31 00
9	" 19, "	" Geo. Logan	" "	6 " " 21.00; " " 24.50	45 50
1970	" 19, "	" John L. Bray	" "	4 " " 14.00; " " 12.80	26 80
1	" 19, "	" H. H. Wright	" "	5 " " 17.50; " " 10.10	27 60
2078	June 2, 1890	" H. W. Day	" "	3 " " 10.50; " " 7.70	18 20
2113	" 14, "	" James Russell	" "	1 " " 3.50; " " Nil	3 50
4	" 14, "	" Geo. Logan	" "	1 " " 3.50; " " "	3 50
5	" 14, "	" H. H. Wright	" "	1 " " 3.50; " " "	3 50
6	" 14, "	" H. W. Day	" "	1 " " 3.50; " " "	3 50
2	" 14, "	" John L. Bray	" "	1 " " 3.50; " " "	3.50
2263	April 18, 1891	" A. F. Rogers	Committee *re* Legislation	4 " " 14.00; " " 18.00	32 00
4	" 23, "	" V. H. Moore	" "	3 " " 10.30; " " 15.50	26 00

*On 15th June, 1889, when being paid for attendance at Council meeting

Dr. Fowler refunded	$3 50
" Bergin	6 50
" Moore	3 50

which amounts had erroneously been paid them on 15th May, '89, for hotel allowance at Executive Committee meeti gs.

ALL PAYMENTS made to members of the Council for hotel and travelling expenses in connection with Committees.

Cheque.	To whom.	To whom paid.	Service.	Deatils.	Amount.
5	....	Dr. Henry W. Day.....	Committee *re* Legislation.....	6 days' hotel, $21.00; travelling expenses, $17.50.....	$38 50
6	April 24, 1891	" A. F. Rogers.....	" "	10 " " 35.00; " " 36.00.....	71 00
2275	May 9, "	" James Thorburn....	" "	9 " " 31.50; " " Nil.....	31 50
6	" 19, "	" D. Bergin.....	" "	2 " " 7.00; " " 25.50	32 50
2294	" 27, "	" D. Bergin.....	" *re* Education.....	13 " " 45.50; " " 75.50.....	121 00
2302	June 13, "	" John L. Bray.....	Select Committee *re* curriculum.	2½ " " 8.75; " " 11.00	19 75
2331	" 16, "	" A. J. Johnson.....	Committee *re* curriculum.....	5 " " 17.50; " " Nil..	17 50
2	" 17, "	" James Thorburn	" "	5 " " 17.50; " " Nil.....	17 50
3	" 17, "	" W. H. Oliphant.....	" "	4 " " 14.00; " " Nil.....	14 00
2423	Mar. 17, 1892	" V. H. Moore.....	" *re* Legislation.....	2 " " 7.00; " " 13.75.....	20 75
4	" 17, "	" H. W. Day.....	" "	2 " " 7.00; " " 8.25.....	15 25
5	" 17, "	" J. A. Williams.....	" "	1 " " 3.50; " " 5.00.....	8 50
6	" 17, "	" A. J. Johnson.....	" "	1 " " 3.50; " " Nil.....	3 50
7	" 17, "	" D. Bergin.....	" "	1 " " 3.50; " " 25.50..	29 00
8	" 17, "	" Fife Fowler.....	" "	2 " " 7.00; " " 13.00.....	20 00
9	" 17, "	" Wm. Britton.....	" "	1 " " 3.50; " " Nil.....	3 50
2430	" 17, "	" James Thorburn	" "	1 " " 3.50; " " Nil..	3 50
1	" 17, "	" R. B. Orr.....	" "	1 " " 3.50; " " Nil.....	3 50
2	" 17, "	" C. J. Campbell... ..	" "	1 " " 3.50; " " 6.50.....	10 00
4	" 17, "	" W. B. Geikie..... .	" "	1 " " 3.50; " " Nil.....	3 50
9	April 7, "	" J. Arthur William..	" " ....6th Ap'l	1 " " 3.50; " " 5.00.....	8 50

COMMITTEE *re* Legislation.

No. of Cheque.	Date.	To whom paid.	No. of days attendance.	At $10 per diem.	Hotel allowance at $3.50 per diem.	Travelling expenses.	Total.	
2263	April 18, 1891	Dr. A. F. Rogers	4	40	14 00	18 00	72 00	
4	" 23, "	" V. H. Moore	4	40	10 50	15 50	66 00	
5	" 23, "	" Henry W. Day	7	70	21 00	17 50	108 50	
6	" 24, "	" A. F. Rogers	10	100	35 00	36 00	171 00	
								417 50
8	" 24, "	" R. A. Pyne	to cover disbursements for cabs $1.50 and $1.00					2 50
2275	May 9, "	" James Thorburn	9	90	31 50		121 50	121 50
6	" 19, "	" D. Bergin	4	40	7 00	25 50	72 50	72 50
								614 00
2423	Mar. 17, 1892	" V. H. Moore	2	20	7 00	13 75	40 75	
4	" 17, "	" H. W. Day	2	20	7 00	8 25	35 25	
5	" 17, "	" J. A. Williams	1	10	3 50	5 00	18 50	
6	" 17, "	" A. J. Johnson	1	10	3 50		13 50	
7	" 17, "	" D. Bergin	2	20	3 50	25 50	49 00	
8	" 17, "	" Fife Fowler	2	20	7 00	13 00	40 00	
9	" 17, "	" Wm. Britton	1	10	3 50		13 50	
2430	" 17, "	" James Thorburn	1	10	3 50		13 50	
1	" 17, "	" R. B. Orr	1	10	3 50		13 50	
2	" 17, "	" C. J. Campbell	1	10	3 50	6 50	20 00	
4	" 17, "	" W. B. Geikie	1	10	3 50		13 50	
								271 00
9	April 7, "	" J. A. Williams (on 6th April)	1	10	3 50	5 00		18 50
2453	May 6, "	" R. A. Pyne	to cover disbursements—stenographer, $25.00; telegrams, $2.80					27 80
						Total		$317 30

W. T. AIKINS, Treasurer.

No. 87.

Return to an Order of the House of the 10th day of May, 1893, for a Return shewing the number of votes polled in favor of, and against, the Scott Act By-laws when last carried in the different Counties and Cities of this Province. Also, the number of votes polled when the same Counties or Cities repealed such By-laws, and including the vote in those Counties and Cities where the By-laws, under this Act, did not pass. Presented to the Legislature, 16th May, 1893. Mr. *Gibson (Huron)*. (*Not printed.*)

No. 88.

Return to an Order of the House of the tenth day of May, 1893, for a Return of all convictions under the Liquor License Act in the Riding of North Ontario during the years 1891 and 1892. Also, of all moneys paid to the License Inspector for salary and expenses during said years, distinguishing the amounts paid for salary and the amounts paid for expenses. Also, of the particulars of any fines which may have been remitted during said years. Also, of the gross amounts of money received by the inspector in his official capacity during said two years, and a detailed statement of the amounts disbursed by him during the same time, shewing to whom and for what such disbursements were made. Presented to the Legislature, 16th May, 1893. Mr. *Glendinning.* *(Not printed.)*

RETURN

To an Order of the House for a Statement of the Amounts Loaned to the Municipalities of the Province under the Tile, Stone and Timber Act, from 1st January, 1890, to 31st December, 1892

Presented to the Legislative Assembly of Ontario.

By Command,

J. M. GIBSON,
Secretary.

Toronto, 19th May, 1893.

RETURN

To an Order of the House for a Statement of the Amounts Loaned to the Municipalities of the Province under the Tile, Stone and Timber Act, from 1st January, 1890 to 31st December, 1892.

County of	Township of	Township amounts.	County amounts.
		$ c.	$ c.
Elgin	Aldborough	3,000 00	
	Bayham	1,200 00	
	Malahide	2,000 00	
	Southwold	400 00	
	Yarmouth	1,200 00	7,800 00
Essex	Colchester, North	1,000 00	1,000 00
Huron	Morris	500 00	500 00
Lambton	Bosanquet	1,600 00	
	Brooke	2,300 00	
	Moore	2,600 00	
	Plympton	4,900 00	
	Sombra	700 00	
	Warwick	800 00	
	Sarnia	1,500 00	14,400 00
Kent	Camden	1,500 00	
	Harwick	1,200 00	
	Howard	1,000 00	
	Orford	1,200 00	4,900 00
Middlesex	Caradoc	300 00	
	Eckfrid	1,600 00	
	Mosa	400 00	2,300 00
Victoria	Ops	800 00	800 00
Waterloo	Waterloo	2,800 00	2,800 00
		34,500 00	34,500 00

D. E. CAMERON,
Assistant Treasurer.

REPORT

Of the Secretary and Registrar of the Province of Ontario, for the year ending the 31st day of December, 1892.

Presented to the Legislative Assembly of Ontario.

By Command,

J. M. GIBSON,

Secretary.

Provincial Secretary's Office,
Toronto, May 19th, 1893.

REPORT

OF THE

SECRETARY AND REGISTRAR

OF THE

PROVINCE OF ONTARIO

FOR THE YEAR ENDING 31ST DECEMBER, 1892.

To the Honourable GEORGE AIREY KIRKPATRICK,

Member of the Queen's Privy Council for Canada, and Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

The undersigned begs respectfully to present to Your Honour the report prepared with respect to the chief transactions of the Department of the Secretary and Registrar of the Province of Ontario during the year ending the 31st day of December, 1892.

J. M. GIBSON,
Secretary and Registrar of the Province of Ontario.

PROVINCIAL SECRETARY'S OFFICE,
TORONTO, May 19th, 1893.

PROVINCIAL SECRETARY'S OFFICE,
TORONTO, 1st May, 1893.

To the Honourable JOHN MORISON GIBSON,
M.A., LL.B., Q.C., M.P.P., etc.
Secretary and Registrar of the Province of Ontario.

SIR,—On submitting my report for the year 1892, I have the honour to state that, as compared with the year 1891, and any previous year, there was, during 1892, a considerable increase in the routine and general work of this office, chiefly owing to the correspondence that arose out of the administration of the "Act to amend the Act for the Protection of Game and Fur-bearing Animals," assented to on the 14th of April, 1892.

The individual subjects dealt with last year, as indicated by the entries made in the Office Register, amounted in number to five thousand, four hundred and sixty-four, being nearly eight hundred in excess of any previous year. In connection with these subjects, fourteen thousand, one hundred and nine letters, despatches and telegrams were written and sent out, and fifteen thousand, two hundred and thirty-three letters, telegrams and despatches received. The consideration of these subjects necessitated two thousand, six hundred and seventy references to other Departments, from which, upon these and other matters, two thousand, six hundred and fourteen reports were received.

The following is a statement, by months, of the correspondence referred to:—

TABLE OF CORRESPONDENCE, ETC., 1892.

Months.	No of despatches, letters and telegrams received.	No. of fyles received from other Departments.	No of despatches, letters and telegrams written and sent out.	No. of fyles referred to other Departments.
January	1,498	220	1,883	195
February	1,726	277	1,598	241
March	1,260	242	1,291	267
April	1,031	242	1,020	195
May	1,047	207	1,098	158
June	760	178	1,023	204
July	623	186	699	222
August	946	181	1,023	205
September	1,041	216	1,057	217
October	1,436	249	1,865	253
November	1,192	219	1,388	225
December	1,549	253	1,788	232
Totals	14,109	2,670	15,233	2,614

During the year, twenty-eight thousand, six hundred and fifty-nine Marriage Act forms were distributed to the various Issuers in the Province, from whom was received, in the aggregate, as fees, the sum of $2,865.90.

During 1892, four hundred and ten warrants dealing with persons who were, or had been, insane were issued. Of these, two hundred and sixty-three were for the removal of duly certified lunatics from the county gaols to asylums; seventy-nine for the discharge from asylums of patients who had been reported to be cured or to have been sufficiently restored to be set at liberty, and sixty-two for the transfer of lunatics from one asylum to another. Besides these, six special warrants were issued.

The usual supplies of blank forms for the use of Joint Stock Companies, Sheriffs and others were printed and distributed.

During the year, five hundred and nineteen appointments to office, six proclamations and two hundred and seven notices of a general character were inserted by the Department in the *Ontario Gazette*. The proclamations were as follows:—

I. Summoning the members of the Legislative Assembly for the despatch of business on the 8th of January, 1892.

II. Proclamation issued by the Honourable George Airey Kirkpatrick, Member of Her Majesty's Privy Council for Canada, making known his appointment, by Commission, under the Great Seal of Canada, bearing date the 28th day of May, 1892, by His Excellency the Governor General, to be Lieutenant Governor in and over the Province of Ontario.

III. Extending to the County of Elgin, including the City of St. Thomas, the provisions of "An Act to simplify Titles, and to facilitate the Transfer of Land," and directing that the provisions of the said Act should take effect in said County and said City on and from the 1st day of October, 1892.

IV. Erecting the Village of Arnprior, in the County of Renfrew, into a Town, and dividing the said Town into wards.

V. Appointing Monday, the 26th day of December, 1892, and Monday, the 2nd day of January, 1893, to be public holidays in lieu of Christmas Day and New Year's Day, which fell upon Sundays.

VI. Postponing, for three months, the holding of the elections for Municipal Councillors and School Trustees for the Municipality of the Township of Hagarty, Sherwood, Richards and Burns, in the County of Renfrew, it having been made to appear that an epidemic of diphtheria existed in the said Municipality.

During the year, one hundred and seventy-seven Letters Patent and Supplementary Letters Patent, the largest number ever issued by the Department, were granted.

By means of fees for these Letters Patent and Supplementary Letters Patent, the Department derived a revenue of $6,780, a sum which, in all probability, will be somewhat increased in 1893 by reason of the adoption of an Order amending the Schedule of Fees theretofore charged for this service, it having been made to appear that the fees for Letters Patent under the Ontario Joint Stock Companies' Letters Patent Act, were, in all cases, less, and, in some instances, very much less, than the fees charged for Letters Patent issued under the corresponding Acts of the Dominion of Canada and of the several Provinces which grant Letters Patent.

Attached to this report are the following appendices:—

I. A Comparative Statement of the work done in the office during certain years, including 1892.

II. A Detailed Statement of the Fees received and of the services rendered by the office during 1892.

III. Copy of an Order-in-Council in respect of the fees to be charged for Letters Patent and Supplementary Letters Patent issued subsequently to the 1st of January, 1893.

IV. An alphabetical list of the Letters Patent and Supplementary Letters Patent granted during the year 1892 and of the Orders-in-Council by which were changed the names of certain Joint Stock Companies.

V. Synopsis of Returns to Addresses and Orders of the House, presented to the Legislative Assembly during the session of 1892.

All of which is respectfully submitted.

G. E. LUMSDEN,

Assistant Secretary.

APPENDIX I.—Comparative Statement showing the work done in Provincial Secretary's Office during the years 1868, 1871, 1875, 1877, 1881, 1883, 1886, 1887, 1888, 1889, 1890, 1891 and 1892.

Work Done.	1868.	1871.	1875.	1877.	1881.	1883.	1886.	1887.	1888.	1889.	1890.	1891.	1892.
Number of fyles, as shown by the office register.	1,172	1,264	1,862	1,983	2,408	3,336	3,575	3,967	4,275	4,434	4,684	4,379	5,464
Letters received	2,107	1,690	3,289	3,162	4,162	5,586	6,097	9,613	10,626	11,027	11,502	12,648	14,109
Letters sent	1,667	1,280	3,326	2,358	3,756	4,646	5,734	9,227	13,458	12,887	12,882	13,573	15,233
References to other departments	481	912	1,642	1,528	1,790	1,885	2,899	2,369	2,948	2,743	3,159	3,013	2,670
Reports from other departments	256	470	966	1,232	1,395	1,275	2,689	1,786	2,760	2,909	3,317	2,685	2,614
Letters Patent of Incorporation	19	24	57	38	119	114	90	88	117	123	144	152	158
Supplementary Letters Patent	.....	.....	.....	.....	.....	10	14	10	19	8	13	16	21
Circulars	240	60	1,429	891	954	500	200	250	600	100	200	500	1,000
Declarations fyled	33	30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Warrants *re* lunatics	34	195	160	256	359	310	394	360	430	360	382	544	410
Notarial certificates	48	72	37	131	76	115	93	122	110	107	127	105	86
Statutory returns	52	58	135	792	2,500	3,200	1,000	1,200	1,500	2,000	2,500	2,800	2,900
Marriage Act forms, etc., issued	.....	.....	28,422	25,381	27,882	29,920	26,254	29,378	29,911	29,712	27,934	28,300	28,659
Printed forms distributed to sheriffs	.....	.....	.....	.....	1,800	1,700	2,000	3,000	3,500	4,000	4,200	5,000	5,000
Other printed forms for municipal & other ret'ns.	.....	.....	.....	.....	3,500	3,600	3,350	3,200	2,700	3,000	200	300	250
Commissions under Great and Privy Seals	135	190	139	170	275	318	227	214	534	359	400	297	328
Fees received	$1,938	$2,282	$5,688	$5,253	$7,021	$8,190	$6,947	$7,711	$9,190	$8,801	$11,075	$9,193	$11,219
Ontario Gazette:													
Proclamations published	.....	16	21	33	17	4	13	4	13	19	11	10	6
Appointments gazetted	110	149	94	460	525	461	535	613	541	518	489	468	519
Public notices	47	58	80	36	127	123	119	121	150	141	166	179	107

APPENDIX II.

A Detailed Statement of fees received and services rendered therefor, 1892.

Services.	Authorized fee.	Number.	January.	Number.	February.	Number.	March.	Number.	April.	Number.	May.
	$ c.		$ c.		$ c.		$ c.		$ c.		$ c.
Commissions to Notaries Public	8 00	6	48 00	6	48 00	9	72 00	8	64 00	4	32 00
Commissions under the Great Seal	13 00	4	52 00	4	52 00	7	91 00	7	91 00	1	13 00
Superior Court Certificates	4 00	..	.....	2	8 00	2	8 00	1	4 00	1	4 00
County Court Certificates	2 50	1	2 50	..	.....	1	2 50	..	.....	..	.....
Surrogate Court Certificates	2 00	..	.....	1	2 00	1	2 00	2	4 00	3	6 00
Judicial Notarial Certificates	1 00	4	4 00	8	8 00	13	13 00	11	11 00	4	4 00
Subpœna	.....	..	.....	..	.....	..	.....	1	1 00	..	.....
Passports	1 00	2	2 00	2	2 00	..	.....	..	.....	1	1 00
Declarations	5 00	1	5 00	..	.....	..	.....	1	5 00	..	.....
Escheats	20 00	..	.....	..	.....	..	.....	..	.....	..	.....
Changes of name	12 00	..	.....	1	12 00	..	.....	..	.....	..	.....
Orders-in-Council	12 00	..	.....	1	12 00	..	.....	..	.....	..	.....
Charters of Incorporation, etc	.....	9	310 00	14	415 00	20	715 00	21	760 00	15	480 00
Searches, copies, etc	.....	..	2 50	..	4 95	..	3 00	..	3 15	..	2 20
Marriage License forms	.....	..	200 00	..	180 00	..	331 00	..	251 50	..	185 00
		27	$626 00	39	$743 95	53	$1,237 50	52	$1,194 65	29	$727 20

APPENDIX II.—*Continued.*

Services.	Authorized fee.	Number.	June.	Number.	July.	Number.	August.	Number.	September.
	$ c.		$ c.		$ c.		$ c.		$ c.
Commissions to Notaries Public	8 00	9	72 00	3	24 00	1	8 00	7	56 00
Commissions under the Great Seal	13 00	3	39 00	3	39 00	5	65 00	3	39 00
Superior Court Certificates	4 00	..	.....	2	8 00	..	.....	2	8 00
County Court Certificates	2 50	1	2 50	..	.....	..	.....	..	.....
Surrogate Court Certificates	2 00	3	6 00	1	2 00	1	2 00	..	.....
Judicial Notarial Certificates	1 00	7	7 00	10	10 00	5	5 00	9	9 00
Subpœna	.....	..	.....	..	.....	..	.....	..	.....
Passports	1 00	1	1 00	..	.....	..	.....	..	.....
Declarations	5 00	..	.....	..	.....	..	.....	..	.....
Escheats	20 00	..	.....	..	.....	1	20 00	1	20 00
Changes of name	12 00	..	.....	..	.....	..	.....	..	.....
Orders-in-Council	12 00	1	12 00	..	.....	..	.....	2	24 00
Charters of Incorporation, etc	.....	18	640 00	17	690 00	13	480 00	6	260 00
Searches, copies, etc	.....	..	2 40	..	1 75	..	60	..	2 40
Marriage License forms	.....	..	191 00	..	182 40	..	140 00	..	342 00
		43	$972 90	36	$957 15	26	$720 60	30	$760 40

APPENDIX II.—*Concluded.*

Services.	Authorized fee.	Number.	October.	Number.	November.	Number.	December.	Total number.	Total amount.
	$ c.		$ c.		$ c.		$ c.		$ c.
Commissions to Notaries Public	8 00	9	72 00	5	40 00	4	32 00	71	568 00
Commissions under the Great Seal	13 00	3	39 00	4	52 00	5	65 00	49	637 00
Superior Court Certificates	4 00	2	8 00			2	8 00	14	56 00
County Court Certificates	2 50							3	7 50
Surrogate Court Certificates	2 00							12	24 00
Judicial Notarial Certificates	1 00	5	5 00	7	7 00	3	3 00	86	86 00
Subpœna								1	1 00
Passports	1 00							6	6 00
Declarations	5 00			1	5 00	1	5 00	4	20 00
Escheats	20 00							2	40 00
Changes of name	12 00							1	12 00
Orders-in-Council	12 00	1	12 00			2	24 00	7	84 00
Charters of Incorporation, etc		23	700 00	20	780 00	15	550 00	191	6,780 00
Searches, copies, etc			1 90		2 45		4 65		31 95
Marriage License forms			231 00		325 00		307 00		2,865 90
		43	$1,068 90	37	$1,211 45	32	$998 65	447	$11,219 35

APPENDIX III.

Fees for Letters Patent.

Copy of an Order-in-Council approved by His Honour the Lieutenant-Governor, the 28th day of December, A. D. 1892.

Upon consideration of the report of the Honourable the Provincial Secretary, dated 22nd December, instant, the Committee of Council advise that the following table of feet for Letters Patent be approved of by Your Honour, to take effect on and from the firss day of January, 1893, but only in respect of applications of which notice shall first be given in *The Ontario Gazette* for 1893.

Schedule of fees payable prior to the issue of charters :—

When the Charter is for an Educational Institution	$ 10 00
When the Charter is for a Cheese or Butter Company	10 00
For a Charter when the proposed capital of the Company is $1,000,000 or upwards	250 00
When it is $500,000, but is less than $1,000,000	200 00
When it is $200,000, but is less than $500,000	150 00
When it is $100,000, but is less than $200,000	100 00
When it is $50,000, but is less than $100,000	50 00
When it is $25,000, but is less than $50,000	40 00
When it is less than $25,000, but is more than $2,000	30 00
When it is $2,000 or less	20 00

Fees for all Supplementary Letters Patent to be $25, unless the capital stock of the company is increased, when the same fee shall be payable as would be charged if the company was being incorporated, but only with reference to the increased capital

The Committee further advise that, in future, applications for a license to enable a company incorporated out of Ontario to hold lands therein, be granted only when it shall be made to appear that the objects of the applicant company are such as would not enable it to become incorporated under sub-section 11 of section 92 of The British North America Act, and that the fee for a license be charged according to the capital of the company, and be the same in amount as if the company was being incorporated.

And the Committee further advise that the fee to be charged for a license granted under R. S. O. 1887, cap. 168, authorizing corporations and institutions incorporated out of Ontario to lend and invest moneys therein, be according to the capital of the company, and be the same in amount as if the company was being incorporated.

And the Committee further advise that all Orders-in-Council at variance with the above be rescinded.

Certified,

J. LONSDALE CAPREOL,
Assistant-Clerk, Executive Council.

APPENDIX IV.

List of Joint Stock Companies, 1892.

Name of Company.	Date.	Capital.
		$ c.
The Arnprior Electric Light and Power Company (Limited)	August 3rd	30,000 00
The Algoma Land and Colonization Company (Limited)	October 27th	500,000 00
The Althouse Automatic Car Coupler Company of Toronto (Limited)	August 9th	100,000 00
The Aylesbury Dairy and Produce Company of Toronto (Limited)	October 20th	3,000 00
The Athletic Building Company of Rat Portage (Limited)	" 20th	20,000 00
The Aylmer Furniture Company (Limited)	" 16th	20,000 00
The Berlin Publishing Company (Limited)	April 23rd	6,000 00
The Berlin Shirt and Collar Company (Limited)	" 4th	40,000 00
The Boyd, Bower and Brumell Company of Toronto (Limited)	July 15th	25,000 00
The Burlington Pressed Brick and Terra Cotta Company (Limited)	August 9th	30,000 00
The Brantford Hedge Company (Limited)	October 12th	70,000 00
The Brantford Electric and Power Company (Limited)	November 7th	150,000 00
The Barkwell Chemical Company of London (Limited)	August 18th	200,000 00
The Barrie Tanning Company (Limited)	December 7th	40,000 00
The Brockville Carriage Company (Limited)	March 19th	100,000 00
The Cardinal Manufacturing Company (Limited)	January 20th	10,000 00
The Caledonia Milling Company (Limited)	February 5th	25,000 00
The Central Fair Agricultural and Industrial Company of Hamilton (Ltd.)	" 27th	100,000 00
The Cross Lake Silver Mining Company (Limited)	March 29th	50,000 00
The Consolidated Railway Equipment Company of Toronto (Limited)	April 21st	50,000 00
The Commercial Mining Company of Algoma (Limited)	April 22nd	100,000 00
The Citizens' Telephone and Electric Company of Rat Portage (Limited)	June 1st	40,000 00
The Commercial Agency of Toronto (Limited)	" 1st	3,000 00
The Cayuga Natural Gas Company (Limited)	" 1st	20,000 00
The Crescent Nickel Mining Company of Algoma (Limited)	October 7th	200,000 00
The Central Bridge and Engineering Company of Peterborough (Limited)	June 1st	200,000 00
The Creighton Gold Mining Company (Limited)	November 16th	1,000,000 00
The Consumers' Natural Gas Company of Dunnville (Limited)	December 7th	4,000 00
The Couchiching Park Company (Limited)	March 19th	50,000 00
The Drury Nickel Company (Limited)	January 6th	500,000 00
The Dufferin Park Company of Toronto (Limited)	June 1st	40,000 00
The Duncan Lithographing Company of Hamilton (Limited)	" 23rd	50,000 00
The Dunlop Cure Company of Woodstock, Ontario, (Limited)	September 15th	10,000 00
The D. R. Dewey Coal Company of Hamilton (Limited)	February 12th	75,000 00
The English Publishing Company of Toronto (Limited)	June 9th	8,000 00
The Eagle Nest Gold Mining Company of Ontario (Limited)	August 3rd	200,000 00
The External Journal Loose Pulley Company of Toronto (Limited)	July 28th	50,000 00
The Fergus Elevator Company (Limited)	February 12th	6,500 00
The Fort Erie Grove Hotel Company (Limited)	June 21st	35,000 00
The Farmers' Binder Twine and Agricultural Implement Manufacturing Company of Brantford (Limited)	October 25th	100,000 00
The Fruit, Spice and Botanic Extract Company of Plantagenet (Limited)	" 20th	10,000 00
The F. F. Dalley Company of Hamilton (Limited)	September 30th	90,000 00
The Gibbard Furniture Company of Napanee (Limited)	April 6th	30,000 00
The Grant-Lottridge Brewing Company (Limited)	" 27th	200,000 00
The Georgian Bay Wood Supply Company (Limited)	October 12th	100,000 00
The Goodwin Law Book and Publishing Company of Toronto (Limited)	August 3rd	50,000 00
The Globe Hat and Cap Manufacturing Company of Toronto (Limited)	" 31st	30,000 00
The Gem Soap Company of Toronto (Limited)	December 7th	3,000 00
The Glengarry Reformer Newspaper Company (Limited)	January 6th	2,400 00
The Gold Rock Mining and Smelting Company of Algoma and Nipissing (Limited)	" 23rd	100,000 00
The Grand Valley Elevator Company (Limited)	March 5th	3,000 00
The Hamilton Electric Railway Company (Limited)	" 5th	300,000 00
The Homestake Mining Company of Algoma (Limited)	April 23rd	300,000 00
The Hastings Mining and Reduction Company (Limited)	August 4th	100,000 00
The Harmon Home and Day School Company of Ottawa (Limited)	July 28th	25,000 00
The H. P. Davies Company of Toronto (Limited)	August 24th	50,000 00
The Huntsville Lumber Company (Limited)	October 12th	42,000 00

APPENDIX IV.—*Continued.*

Name of Company.	Date.	Capital.
		$ c.
The Hamilton Natural Gas and Mining Company (Limited)	October 27th	50,000 00
The Hamilton Facing Mill Company (Limited)	January 20th	25,000 00
The Journal Printing Company of Ottawa (Limited)	June 1st	50,000 00
The Jouffret Manufacturing Company of Toronto (Limited)	September 15th	3,000 00
The J. E. Ellis Company (Limited)	June 21st	100,000 00
The James Stewart Manufacturing Company of Woodstock (Limited)	April 6th	100,000 00
The King Milling Company of Sarnia (Limited)	March 11th	50,000 00
The Kingston Amateur Athletic Association (Limited)	May 6th	10,000 00
The Knechtel Furniture Company (Limited)	July 15th	100,000 00
The Kramer-Irwin Rock Asphalt and Cement Paving Company of Hamilton (Limited)	" 15th	100,000 00
The Kingsville Preserving Company (Limited)	" 15th	40,000 00
The Lake Simcoe Ice Supply and Cold Storage Company (Limited)	May 4th	100,000 00
The Leishman-Maundrell Company of Woodstock (Limited)	" 4th	13,000 00
The Lindsay Opera House Company (Limited)	June 1st	40,000 00
The Light, Heat and Power Company of Newmarket (Limited)	August 3rd	40,000 00
The Lansdowne and Rockport Telephone Company (Limited)	June 23rd	2,500 00
The Low Phosphorus Ore Properties Company of Ontario (Limited)	October 20th	350,000 00
The Limestone Creek Fishing and Hunting Club (Limited)	November 30th	2,700 00
The Lundy's Lane Observatory Company (Limited)	December 16th	10,000 00
The McMaster Manufacturing Company of Orangeville (Limited)	February 12th	30,000 00
The Mimico Sewer Pipe and Brick Manufacturing Company (Limited)	April 14th	50,000 00
The Manitoulin and North Shore Telephone and Telegraph Company (Limited)	June 1st	20,000 00
The Macfarlane Shade Company of Toronto (Limited)	" 3rd	100,000 00
The Merritton Wood and Pulp Company (Limited)	January 15th	150,000 00
The New Toronto Oil and Natural Gas Company (Limited)	March 29th	400,000 00
The Newmarket Mat and Rug Company (Limited)	April 21st	40,000 00
The Nasmith Company of Toronto (Limited)	June 23rd	100,000 00
The Niagara District Fruit Preserving Company of St. Catharines (Limited)	" 9th	30,000 00
The Newbury Creamery Company (Limited)	September 15th	3,000 00
The Norwich Elevator Company (Limited)	October 20th	2,500 00
The Ontario Box Company (Limited)	April 27th	25,000 00
The Ontario Medical Journal Publishing Company (Limited)	June 9th	3,000 00
The Ottawa Land Association (Limited)	September 9th	50,000 00
The Ontario Chemists' Manufacturing Company (Limited)	August 3rd	100,000 00
The Ontario Power and Flats Company (Limited)	July 28th	175,000 00
The Ontario Wool Boot Company of Hanover (Limited)	September 15th	25,000 00
The Ottawa Transfer Company (Limited	October 12th	24,000 00
The Ontario Peat Fuel Company (Limited)	November 2nd	300,000 00
The Ontario Standard Oil Company (Limited)	December 15th	100,000 00
The Ontario Malleable Iron Company (Limited)	November 30th	100,000 00
The Oneida Quarry Company (Limited)	March 5th	50,000 00
The Owen Sound Rink Company (Limited)	December 15th	3,000 00
The Peterborough Medicine Company (Limited)	November 2nd	3,000 00
The Parkin Lumber Company of Lindsay (Limited)	February 13th	35,000 00
The Patrons of Industry Warehouse Company of the County of Simcoe (Limited)	June 1st	1,800 00
The Page Wire Fence Company of Ontario (Limited)	July 28th	40,000 00
The Paul Frind Woollen Machinery Company of Toronto (Limited)	November 16th	50,000 00
The Priory Club of Guelph (Limited)	" 16th	2,000 00
The Pennington-Baker Seating Company of Ontario (Limited)	" 16th	50,000 00
The Peterborough Canoe Company (Limited)	June 1st	3,000 00
The Queen City Yacht Club of Toronto (Limited)	March 25th	6,000 00
The Richard Fitzgerald Company of St. Catharines (Limited)	March 29th	20,000 00
The Ridgetown Canning and Preserving Company (Limited)	June 1st	25,000 00
The Rat Portage and Keewatin Electric Street Railway Company (Limited)	" 1st	300,000 00
The River Canard Gun Club (Limited)	October 20th	700 00
The Reimers Piano Company of Toronto (Limited)	June 21st	12,000 00

APPENDIX IV.—*Concluded.*

Name of Company.	Date.	Capital.
		$ c.
The R. J. Doyle Manufacturing Company of Ontario (Limited)	January 14th	100,000 00
The Rosedale Pressed Brick and Terra Cotta Company (Limited)	March 19th	30,000 00
The Stratford Hedge Fence Company (Limited)	January 20th	70,000 00
The Sudbury Customs Smelting Company (Limited)	March 15th	75,000 00
The Sebringville Flax Company (Limited)	March 30th	12,500 00
The Sadler, Dundas and Flavelle Milling Company (Limited)	April 14th	150,000 00
The Superior Lumber Company of Ontario (Limited)	June 1st	100,000 00
The Stereotype Plate Company of Ontario (Limited)	September 20th	25,000 00
The Sarnia Salt Company (Limited)	July 28th	20,000 00
The Spring Brook Public Hall Company (Limited)	September 20th	2,000 00
The Smiths' Falls Electric Power Company (Limited)	November 9th	60,000 00
The St. Catharines Mineral Water and Humanitas Company (Limited)	December 21st	100,000 00
The Sanitary and Non-explosive Gas Company of Ontario (Limited)	January 6th	150,000 00
The South Falls Shingle Company (Limited)	" 27th	3,000 00
The Strathroy Canning and Preserving Company (Limited)	February 24th	50,000 00
The Smith Brothers Company of Toronto (Limited)	March 8th	3,000 00
The Toronto Steel-Clad Bath and Metal Company (Limited)	June 21st	40,000 00
The Toronto Art Exhibit Company (Limited)	August 3rd	40,000 00
The Toronto and Scarborough Electric Railway, Light and Power Company Limited)	" 18th	100,000 00
The Trinidad Asphalt Company of Toronto (Limited)	June 9th	100,000 00
The Toronto Public Hall and Building Company (Limited)	July 15th	100,000 00
The Toronto Chemical Smelting Company (Limited)	August 31st	100,000 00
The Taché Gold Mining Company of Ontario (Limited)	November 3rd	500,000 00
The Thomas Nightingale Pressed Brick Company (Limited)	" 30th	50,000 00
The Trenton Electric Company (Limited)	December 7th	50,000 00
The Thompson-Morris Hand Power Propellor Company of Hamilton (Limited)	" 14th	10,000 00
The Toronto Nickel Company (Limited)	" 14th	300,000 00
The Tilsonburg Driving Park Association (Limited)	November 16th	8,000 00
The Toronto Junction Printing and Publishing Company (Limited)	January 20th	10,000 00
The Tribune Printing Company of Toronto Junction (Limited)	March 11th	15,000 00
The T. H. Taylor Company (Limited)	" 14th	150,000 00
The Union Suspender Company of Toronto (Limited)	April 21st	10,000 00
The Victoria Electric Light Company of Lindsay (Limited)	February 13th	10,000 00
The Vernon Company of Ontario (Limited)	December 7th	300,000 00
The William Davies Company (Limited)	July 28th	250,000 00
The Williamson Book Company of Toronto (Limited)	June 1st	50,000 00
The West Lorne Canning and Evaporating Company (Limited)	" 21st	20,000 00
The Worsted and Braid Company of Toronto (Limited)	November 18th	100,000 00
The Watson Manufacturing Company of St. Catharines (Limited)	" 16th	30,000 00
The Windsor Patent Brush Company (Limited)	" 16th	25,000 00
The W. H. Comstock Company (Limited)	" 30th	300,000 00
The Ward Boat Company of London (Limited)	March 5th	2,500 00
The Weller's Bay Cheese and Butter Manufacturing Company (Limited)	" 22nd	1,500 00

SUPPLEMENTARY LETTERS PATENT.

(Increasing capital.)

Name of Company.	Date.	Capital Increased.	
		From.	To.
The Barrie Electric Light Company	22nd March	$ 50,000	$100,000
The Dunnville Natural Gas Company	1st June...	5,000	20,000
The Drury Nickel Company (Limited)	21st Dec...	500,000	1,000,000
The Hamilton Brass Manufacturing Company	28th July..	3,000	60,000
The Hemming Brothers Company of Toronto	9th Sept....	50,000	100,000
The Huron Cheese and Butter Company	22nd March	3,000	6,000
The Kingston Hosiery Company	14th Dec...	100,000	200,000
The Moneymore Cheese Company	22nd April.	1,800	2,000
The Niagara Falls Electric Light and Power Company	21st June..	20,000	40,000
The Novelty Manufacturing Company of Newmarket	23rd June..	12,000	25,000
The North Shore Navigation Company of Ontario	15th July..	50,000	150,000
The Ontario Bolt Company	5th Feb....	120,000	200,000
The Peterborough Canoe Company	27th Oct...	3,000	40,000
The Sarnia Curling and Skating Rink Club	9th Sept...	3,000	25,000
The Steele Brothers Company	27th Oct...	100,000	150,000
The Toronto Electric Light Company	5th April...	300,000	500,000
The Toronto Liederkrantz	1st June...	1,000	20,000

SUPPLEMENTARY LETTERS PATENT.

(Extending powers).

Name of Company.	Date.
The Breithaupt Leather Company (Limited)	9th June.
The House and Land Investment Company of Ontario (Limited)	30th March.
The New Toronto Oil and Natural Gas Company (Limited)	20th October.
The William Davies Company (Limited)	7th October.

Names of Companies changed by Orders-in-Council.

From.	To.
The Berlin Piano Company (Limited)	The Berlin Piano and Organ Company (Limited).
The Brooks Mnf'g. Co. of Peterborough (Limited)	The Peterborough Carbon and Porcelain Co. (Ltd).
The Listowel Furniture Company (Limited)	The Morris-Field-Rogers Co. of Listowel (Limitd).
The North American Chemical Mining and Manufacturing Company of Ontario.	The Owen Sound Portland Cement Co. (Limitd).
The Ontario Bolt Company	The Ontario Forge and Bolt Company (Limited).
The Steele Brothers Company (Limited)	The Steele-Briggs-Marcon Seed Company (Limited).
The Waterloo Woollen Manufacturing Company	The Waterloo Woollen Company (Limited).

APPENDIX V.

Synopsis of Returns to Addresses and Orders of the House presented to the Legislative Assembly during the Session of 1892.

No.	Sessional Papers.	Subject.	Mover.
1	34	Tabulated statement of collections, disbursements, etc., in each License District from 1885 to 1890, inclusive, and a similar statement for 1877	Mr. Willoughby.
2	35	Correspondence on the subject of Dutton High School, etc	Mr. Meredith.
3	36	Commission respecting Prison Reform and expenses incurred in connection therewith	Mr. Clancy.
4	37	Fish and Game Protection Commission and expenses incurred in connection therewith	Mr. Metcalfe.
5	60	Papers respecting the deepening of Nottawasaga River and amounts expended therein	Mr. Wylie.
6	61	Papers and correspondence in reference to widening, deepening, or clearing the channel of Severn River	Mr. Glendinning.
7	64	Respecting the trial of the petition in the North Perth election case.	Mr. Magwood.
8	65	Fees of Registrars for East and West Toronto, earned in 1890, and how disposed of	H. E. Clarke (Toronto).
9	68	Correspondence relating to alleged education of Medical Students at the public expense	Mr. Balfour.
10	69	Number of children under fifteen years arrested during 1890, the number of such children sent to Common Gaols, to Industrial Schools, or Charitable Institutions, the Reformatory for Boys and Girls, or otherwise disposed of	Mr. Monck.
11	71	Correspondence with reference to commission to open the House by other than His Honour the Lieut.-Governor	Mr. Meredith.
12	73	What municipalities have passed by-laws under provisions of 4th Sec., Act 53 Vic., Cap. 55, imposing business tax in lieu of tax on personal property and what municipalities have decided not to put provisions of said section into effect	Mr. Barr (Dufferin).
13	75	Application of Clara Brett Martin to the Law Society of Upper Canada for admission as student-at-law, report of Benchers' Committee and correspondence relating thereto	Mr. Balfour.
14	76	Orders in Council allotting funds to purchase site of Upper Canada College for erection of buildings or equipment of the College	Mr. Meredith.
15	77	Names of applicants for position of assistant teacher of German in University College, and correspondence relating thereto	Mr. Whitney.
16	78	Number of pupils attending Collegiate Institutes and High Schools for the year 1890	Mr. Gibson (Huron).
17	80	Correspondence on fusion of the several divisions of the High Court and changes in practice for holding trial actions, etc	Mr. Meredith.
18	81	Commission as to proposed forest reservation and Park in Nipissing District, with instructions to commissioners	Mr. Meredith.
19	82	Opinion of Court of Appeal as to validity of local option provisions of the Municipal Act	Mr. Meredith.

APPENDIX V.—*Continued.*

Synopsis of Returns to addresses and Orders of the House presented to the Legislative Assembly during the Session of 1892.

No.	Sessional Papers.	Subject.	Mover.
20	83	Orders in Council for withdrawal from sale of mining lands since 1st January, 1890, and of all returns or recommendations on which they were passed. Also list of applications for, and sale of, land made since 1st January, 1889, etc	Mr. White.
21	84	Quantity of pine in unlicensed territory disposed of, the persons to whom, and quantities and prices at which each sale was effected. Terms of sale, etc	Mr. Marter.
22	85	Sale and transfer of Dundas and Waterloo Macadamized road	Mr. Meredith
23	87	Names of persons or bodies who received remuneration for holding religious services in asylums	Mr. Campbell (Durham).
24	90	Amounts received from agricultural and mineral lands, bonuses, ground rents, sale of timber, timber dues, taxes and liquor licenses in Algoma East from 1st January, 1871, to 31st December, 1891, and all Government expenditures therein for same period	Mr. Campbell (Algoma).
25	91	Indigent and insane persons confined in goals	Mr. Barr (Dufferin).
26	92	Further correspondence relating to alleged education of medical students at the public expense	Mr. Balfour.
27	93	Correspondence with reference to expenditures for new site and buildings for Upper Canada College or the endowment of the College	Mr. Miscampbell.
28	94	Respecting the incorporation of Joint Stock Companies, with powers of Trust Companies	Mr. McMahon.
29	97	Sale of timber berth No. 118, north shore of Lake Huron	Mr. Marter.
30	98	Appointment of A. F. Dulmage as an officer of Crown Lands Department, money received by him, amounts paid over and moneys misappropriated by him and amounts paid to him for salary or expenses	Mr. Marter.

PROVINCIAL REGISTRAR'S OFFICE, ONTARIO,
TORONTO, 27th April, 1893.

SIR,—I have the honour to submit for your information a statement of the work done in the Registrar's Branch of the Provincial Secretary's Department from 1st January, 1892, to 31st December, 1892.

I have the honour to be, Sir,
Your obedient servant,

JOHN F. C. USSHER,
Deputy-Registrar.

HON. J. M. GIBSON,
Provincial Registrar.

CONDENSED STATEMENT showing the work done in the Provincial Registrar's Office of the Department of the Provincial Secretary, for the year 1892 :—

Documents.	Recorded.	Indexed.
Commissions under Great Seal	238	238
Commissions under Privy Seal	90	90
Special Commissions	12	12
Letters Patent Incorporations	154	154
Special Letters Patent Incorporations	6	6
Supplementary Letters Patent Incorporations	17	17
Bonds and Covenants	35	35
Warrants removing lunatics.	263	263
Warrants transferring lunatics	62	62
Special Warrants	6	6
Warrants discharging lunatics	79	79
Certificates Provincial Land Surveyors	7	7
Crown Land Patents	774	774
Special Deeds	10	10
Mining Leases	98	98
Certified Copies and Exemplifications of Patents	53	53

In addition to the foregoing an annual Return of all bonds and securities recorded in this Department is prepared for the Legislative Assembly, and a quarterly Return of all the lands is also sent to the Registrars of each County and District in which Patents have issued, giving description of land patented, name of patentee, date, etc., also notices of cancellations and surrenders of patents.

JOHN F. C. USSHER,
Deputy-Registrar.

No. 91.

Return to an Order of the House of the fifth day of May, 1893, for a Return of copies of all correspondence between the Government and the License Commissioners of the County of Dufferin, or any other parties, concerning the resignation of the late License Inspector for the County, Mr. Anderson. Also, for copies of all correspondence between the Government and the said License Commissioners, or other parties, concerning the appointment of the present Inspector, Mr. Dodds. Presented to the Legislature, 19th May, 1893. Mr. *Barr* (*Dufferin*). (*Not printed.*)

RETURN

To a Resolution of the Legislature respecting the dates of Crown Timber Sales from 1871 to 1892, inclusive.

Presented to the Legislative Assembly,

By command,

J. M. GIBSON.
Secretary.

Provincial Secretary's Office,
Toronto, 22nd May, 1893.

RETURN

Called for by resolution of the House of Assembly, dated the 24th day of April, 1893, giving, except that already brought down, the dates of all Crown Timber Sales, from 1871 to 1892, inclusive, as follows:—The date of Sale, the number and extent of the different Timber Berths in square miles, and the prices obtained at each such Sale per square mile.

The date of Sale.	Remarks.
November 23rd, 1871	Information brought down. See Sessional Paper No. 47, A. 1871-2.
October 15th, 1872	" " " " 11, A. 1873.
June 6th, 1877	" " " " 24, A. 1878.
December 6th, 1881	Return herewith.
October 22nd, 1885	Information brought down. " " 34, A. 1887.
ecember 15th, 1887	Return herewith.
October 1st, 1890	"
October 13th, 1892	Information brought down. See return called for by resolution of 12th April, 1893. Sessional Paper No. 62.

AUBREY WHITE,
Assistant Commissioner.

Department of Crown Lands,
Toronto, May 13th, 1893.

TIMBER SALE OF 1890.

Date of Sale.	Berth No.	Locality.	Area in square miles.	Price per square mile.
				$ c.
October 1	1	Rainy River	23	1,075 00
1	2	"	4	2,450 00
1	3	"	10	1,000 00
1	4	"	13	850 00
1	5	"	10	750 00
1	6	"	35	300 00
1	7	"	6	1,350 00
1	8	"	5	550 00
1	9	"	1	900 00
1	10	"	3	1,000 00
1	12	"	3	1,000 00
1	13	"	7	675 00
1	14	"	1	700 00
1	17	"	1	700 00
1	18	"	4	900 00
1	19	"	11	475 00
1	20	"	5	375 00
1	21	"	4	425 00
1	25	"	11	150 00
1	26	"	10	1,035 00
1	28	"	6	425 00
1	29	"	1	1,300 00
1	30	"	10	700 00
1	31	"	5	1,100 00
1	32	"	7	300 00
1	33	"	2	225 00
1	34	"	9	600 00
1	35	"	4	550 00
1	38	"	14	825 00
1	39	"	12	725 00
1	60	"	5	275 00
1	61	"	18	550 00
1	62	"	5	810 00
1	63	"	2	375 00
1	2	Thunder Bay	7	1,250 00
1	3	"	6¾	2,250 00
1	4	"	8¼	2,250 00
1	5	"	19⅝	400 00
1	8	"	37½	550 00
1		Aweres	18½	2,625 00

AUBREY WHITE,
Assistant Commissioner.

Department of Crown Lands,
Toronto, May 13th, 1893.

TIMBER SALE OF 1887.

Date of Sale.	Berth No.	Locality.	Area in square miles.	Price per square mile.
				$ c.
December 15	1	Biggar	20¾	3,100 00
15	2	"	11¼	3,100 00
15	1	Bishop	13¼	2,150 00
15	1	Ballantyne	22¾	5,500 00
15	2	"	14	2,350 00
15	3	"	19¼	2,600 00
15	4	"	12⅛	850 00
15	1	Butt	15¼	900 00
15	1	Chisholm	22	3,000 00
15	1	Canisby	2⅜	500 00
15	1	Devine	17	4,300 00
15	2	"	13½	2,100 00
15	3	"	11	4,200 00
15	4	"	11⅜	3,000 00
15	1	Hunter	16½	3,500 00
15	2	"	12¼	4,600 00
15	1	Livingstone	8	6,300 00
15	2	"	13¼	4,200 00
15	3	"	11¼	3,400 00
15	4	"	9	2,100 00
15	5	"	8⅜	800 00
15	6	"	9	800 00
15	7	"	7⅜	1,350 00
15	1	Lawrence	15	3,300 00
15	1	McLaughlin	17¾	3,400 00
15	2	"	12⅜	4,400 00
15	1	McClintock	14	2,500 00
15	2	"	12	2,500 00
15	3	"	8⅜	2,300 00
15	4	"	10¼	2,000 00
15	5	"	9¼	1,600 00
15	6	"	11	1,050 00
15	1	Pentland	⅜	400 00
15	1	Wilkes	13⅜	900 00
15	2	"	15¼	1,700 00
15	3	"	17¾	4,000 00
15	1	Nightingale	1⅝	600 00

AUBREY WHITE,
Assistant Commissioner.

Department of Crown Lands,
Toronto, May 13th, 1893.

TIMBER SALE OF 1881.

Date of Sale.	Berth No.	Locality.	Area in square miles.	Price per square mile.
				$ c.
December 6	1	Mowat	18½	50 00
6	2	"	25	50 00
6	3	"	18¾	50 00
6	4	"	12¼	85 00
6	5	"	19	95 00
6	6	"	12¾	155 00
6	1	Blair	20½	100 00
6	2	"	29½	100 00
6	3	"	27¼	155 00
6	4	"	24½	360 00
6	1	McConkey	21¾	1,050 00
6	2	"	16	2,500 00
6	3	"	22	550 00
6	4	"	18½	600 00
6	1	Hardy	17¼	570 00
6	2	"	15½	530 00
6	3	"	20¾	1,100 00
6	4	"	22	530 00
6	1	Patterson	41¾	710 00
6	2	"	19	1,120 00
6	3	"	21¾	860 00
6	4	"	32½	610 00
6	5	"	25½	600 00
6	1	Mills	23½	550 00
6	2	"	12	520 00
6	3	"	18	1,410 00
6	4	"	17	120 00
6	1	Sinclair	16¾	250 00
6	2	"	18¼	300 00
6	3	"	14	1,060 00
6	4	"	14	810 00
6	1	Bethune	23½	340 00
6	2	"	17¾	800 00
6	3	"	12¼	400 00
6	4	"	17	575 00
6	1	Proudfoot	17	360 00
6	2	"	23¾	780 00
6	3	"	15¼	480 00
6	4	"	12¼	555 00
6	1	Gurd	18¼	200 00
6	2	"	25½	150 00
6	3	"	13	130 00
6	4	"	13½	510 00
6	1	Machar	18¼	620 00
6	2	"	21	210 00
6	3	"	18	210 00
6	4	"	13¾	110 00
6	1	Strong	19¾	500 00
6	2	"	13¼	880 00
6	3	"	18½	310 00
6	4	"	10	1,110 00
6	1	Jolly	18½	2,300 00
6	2	"	24¾	460 00
6	3	"	18¼	1,200 00
6	4	"	14	580 00
6	1	Laurier	17¾	260 00
6	2	"	22¼	200 00
6	3	"	19	130 00
6	4	"	12½	110 00
6	1	Pringle	24¾	160 00
6	2	"	18½	150 00
6	3	"	13¼	235 00
6	4	"	17¾	105 00

TIMBER SALE OF 1881.—*Concluded.*

Date of Sale.	Area in square miles.	Locality.	Area in square miles.	Price per square mile.
				$ c.
December 6	1	Lount	17¾	110 00
6	2	"	22½	560 00
6	3	"	18¼	70 00
6	4	"	17	440 00
6	1	Nipissing	17½	60 00
6	2	"	18	160 00
6	3	"	17	250 00
6	4	"	18¾	1,540 00
6	1	Hainsworth	25½	980 00
6	2	"	22	700 00
6	3	"	16	1,100 00
6	4	"	1¾	240 00

RETURN

To an Order passed by the Legislative Assembly, on the 19th day of May, 1893, for a Return shewing the number of petitions that have been presented to the House during the present Session, asking for a Plebiscite on the temperance question from temperance societies, churches and municipal corporations, giving the number from each in the order named. Also, shewing the numbers from each of the above-named bodies in favor of Provincial or other Prohibition, respectively. And the number of Petitions in favor of Bill (No. 70), To prohibit the sale of intoxicating liquors by retail.

J. M. GIBSON,
Secretary.

Provincial Secretary's Office,
Toronto, May 22nd, 1893.

RETURN

Shewing the number of Petitions presented during the present Session (up to the 20th May, 1893,) asking for a Plebiscite on the temperance question, from temperance societies, churches and municipal corporations, the number from each of these bodies in favor of Prohibition, and the number of Petitions in favor of Bill (No. 70), To prevent the sale of liquors by retail.

FOR A PLEBISCITE.

From Temperance Societies	495
" Churches	314
" Municipal Corporations	156
Total for Plebiscite	965

IN FAVOR OF PROHIBITION.

From Temperance Societies	255
" Churches	54
" Municipal Corporations	5
Total in favor of Prohibition	314

IN FAVOR OF BILL (No. 70).

Total	3

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